

JANUARY 1964

35 CENTS 100

# SCIENCE DIGEST

## YOUR GUIDE TO MIND DRUGS

### 1964 BABY

what his  
life will  
be like

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### HOW LONG YOU HAVE TO LIVE

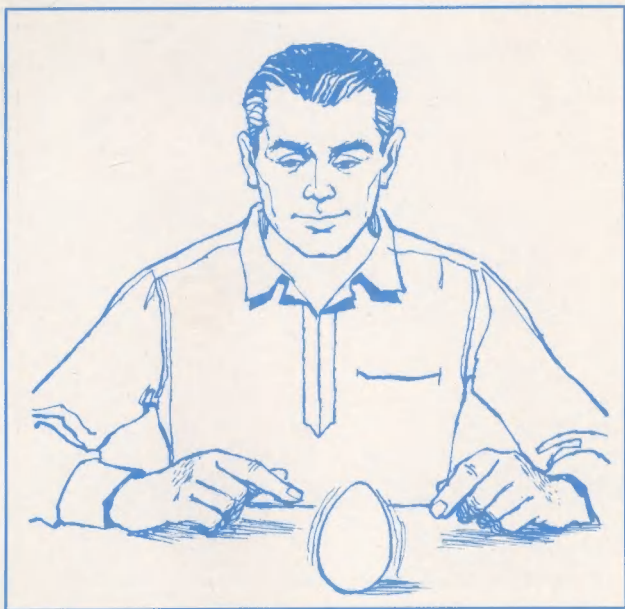
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The 1964 car  
nobody made

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### IF YOU WERE A MIDGET





## The stand-up egg

**H**AVE you ever wondered why a spinning top stands up on its point, yet falls over when not spinning? The same thing happens with a bicycle. As soon as the wheels stop turning, you will find the bicycle falls to one side.

In all such cases, inertia is the reason. Not only does a spinning object try to keep spinning, but it also tries to keep its axle always pointing in the same direction. The gyroscopes that automatically guide

airplanes and missiles work on this idea.

All you need for an experiment on spin is a hard-boiled egg.

Place the egg on its side on a table. Hold the ends in your fingers and spin the egg with a swift twist. If you do this briskly enough, it will soon rise all by itself and stand on one end as it continues to spin.

Friction with the table top is what makes the spinning egg rise. But if you use a raw or a soft-boiled egg, it will not rise because the liquids are flung to the two ends of the egg by the fast spin. This keeps the egg down.

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# SCIENCE DIGEST

Twenty-eighth year of publication

There will be four million,  
two hundred thousand  
babies born in the United States  
in 1964. What does the  
future hold for them, and  
for you? See page 12.



**JANUARY • 1964** VOL. 55, NO. 1

## ARTICLES

STAND-UP EGG .....	Inside Front Cover
BIRD BATH .....	6
HOW TO TEST A BABY'S INTELLIGENCE .....	8
1964 BABY .....	12
HOW LONG YOU HAVE TO LIVE .....	19
THE CHUNNEL—A NEW CHANNEL TUNNEL IDEA .....	21
WHAT AILS THAT—HIC—PHRENIC NERVE? .....	27
IF YOU WERE A MIDGET .....	30
775,000 VOLTS WITH BARE HANDS .....	35
WHAT YOU DON'T KNOW ABOUT MILKING COWS .....	39
AIR YOUR KNOWLEDGE .....	45
NEW MAGIC WITH YOUR OLD TEETH .....	48
ELECTRONIC JUNGLE GOES TO SEA .....	51
THE 1964 CAR THEY DIDN'T BUILD .....	52
YOUR GUIDE TO MIND DRUGS .....	66
AFTER THE MOON, THIS .....	71
THE DISEASE WE CAN CURE, BUT DON'T .....	85
THE LIZARD THAT RUNS ON WATER .....	90
OUT-OF-POCKET KANGAROO .....	Inside Back Cover

## FEATURES

LETTERS .....	2
HOW TO FALL OFF A BUILDING—The Progress of Medicine .....	59
MAKING YOUR LIGHTS GO ON—Your Science ABC's .....	63
THE COMPUTER THAT FLIES—Inventor of the Month .....	76
SCHOOL WITHOUT WINDOWS—Inventions, Patents, Processes .....	77
COULD WE BE NAZI FOLLOWERS?—What's on Your Mind? .....	81
SCIENCE IN THE NEWS .....	91



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## TO LETTERS

SCIENCE DIGEST

### The Negro

After being brainwashed by everyone else's opinions on the Negro race, it was a relief to hear the scientific viewpoint in "The Negro: How He's Different" (Oct. '63). It clearly explained the fact that although the Caucasoids, Mongoloids and Negroids are three distinct types of men, they cannot be ranked in classes of importance. I wish more people knew this!

FLORENCE EIDEN  
Jordan, Minn.

I have read Gunnar Myrdal's opinion about the racial question. Myrdal is overly concerned about a Negro sexual superiority. Myrdal is talking only of his own feelings. He isn't concerned at all about a White Christian Woman who really is the most important. It is apparent he is anti-Christ.

MRS. RUTH BRISSETTE  
Mukwonago, Wis.  
(continued on page 4)



## AMERICA BY CAR

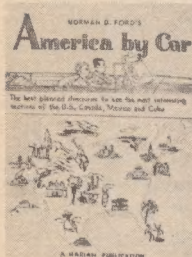
This big book is your insurance of seeing all the four-star sights in whatever corner of the U.S. or Canada you drive to (and it even covers Mexico as well).

Day by day, *America by Car* tells you where to go from Alaska to Mexico. Whether you're visiting New England or California, Florida or the National Parks, the Great Lakes, the Mississippi, California, the East, the South or the Southwest, the Indian country, etc., it tells you road by road the scenic way to go and it always directs you to the important sights along the way and in the cities.

In Niagara or Los Angeles, Washington or New Orleans, the Black Hills or Montreal, *America by Car* takes the guesswork out of travel. Of course it names hundreds upon hundreds of recommended places to eat and stay.

America is so big, you can easily overlook or forget important sights or make many a wrong turn. So get *America by Car*, the book that makes sure you'll see everything of consequence and always travel right.

*America by Car* is fully 170,000 words in length (as large as three ordinary sized novels). But it costs only \$2.50, while it helps you see any part of America as you've probably never before explored this part of the world.



## WHERE TO RETIRE OR VACATION

at what look like prewar prices

In *Off-the-Beaten Path*, Norman Ford's guide to America's own Bargain Paradises, you read of island paradises aplenty in the United States and Canada, of art colonies (artists search for picturesque locations where costs are low), of areas with almost a perfect climate or with flowers on every side.

Here are the real U.S.A.-brand Shangri-Las made for the man or woman who's had enough of crowds. Here, too, are unspoiled seashore villages, tropic like islands and dozens of other spots just about perfect for your retirement or vacation at some of the lowest prices you've heard of since the gone-for-ever prewar days. And for good measure you also read about the low-cost paradises in Hawaii, the Virgin Islands, and Puerto Rico.

You can be sure that *Off-the-Beaten Path* names the low-cost Florida retirement and vacationing towns, the best values in Texas, the Southwest, California, the South and East, Canada—and a dozen other areas which the crowds have not yet discovered.

- That undiscovered region where winters are as warm as Miami Beach's yet costs can be two-thirds less.
- That island that looks like Hawaii yet is 2000 miles nearer (no expensive sea or air trip to get there).
- France's only remaining outpost in this part of the world—completely surrounded by Canadian territory . . . or a village more Scottish than Scotland or age-old Spanish hamlets right in our own U.S. where no one ever heard of nervous tension or the worries of modern day life.
- That remarkable town where a fee of 3¢ a day gives you an almost endless round of barbecues, musicals, concerts, picnics, pot luck suppers, smorgasbord dinners and a fine arts program.

*Off-the-Beaten Path* is a big book filled with facts that open the way to a different kind of retirement or vacation made all the more attractive by the rock-bottom prices. About 100,000 words and plenty of pictures. Yet it costs only \$2.

## FABULOUS MEXICO

Where Everything Costs Less

The land of retirement and vacation bargains. Where you can build a modern home for \$4500 and an American retirement income looks like a fortune. It's the land where your vacation money can buy double or more what it might back home—provided you know where to go for Mexico's best values.

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Norman Ford knows Mexico from north to south, from east to west, and he takes you to vacation and retirement areas that look more like the South Seas than Tahiti itself; to whole sections of just perfect weather where it's like June all year round; plus resort after resort, towns, cities, spas, and what not else where you'll have a vacation to remember at a cost so low it could seem unbelievable.

If you want a delightful retirement area with plenty of Americans around to talk to, he leads you to all the principal retirement towns, as well as dozens of little known, perhaps even more delightful areas, where costs are way far down, there's plenty to do and meeting people is easy. Always, he shows you modern flower-bedecked hotels and inns that charge hardly half of what you might expect to spend in even such a land of vacation and retirement bargains as Mexico.

There's a great deal more besides: everything from exploring ancient pyramids as old as Egypt's to finding fabulous hunting and fishing. If you might want to share in the high interest rates Mexican banks pay or to buy equally high-earning real estate or start a business of your own, this detailed guide to a fabulous land tells you what you must do to start your money earning so much more than in the U. S.

*Mexico—Where Everything Costs Less* opens up Mexico to you. It's a big book, yet it costs only \$1.50. So send for yours today.

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- ☐ America by Car. \$2.50.
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**SPECIAL OFFER: All books above for \$4.00.**

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**The Negro***(Continued from page 2)*

Your efforts to glorify this Myrdal "scientist" seem absurd. It seems that you are part and parcel of the "equalitarians" who are peddling their wares in all communications media.

Many of our magazines go to the high school library labeled "pink." Are we going to have to include *Science Digest*?

A. C. FRYDAY, Principal  
Kilbourne High School  
Kilbourne, La.

Would it be possible for us to have permission to reproduce the article "The Negro—Why Whites Fear Him" by Selma Hirsh (Oct. '63) for use in our classrooms?

W. R. MORESKINE, Principal  
H. Stanley School  
Lafayette, Calif.

*Permission granted.—Ed.*

I am not afraid of the Negro ("The Negro—Why Whites Fear Him," Oct. '63), but I do not want one as a neighbor. I do not want my children to marry one. I do not want them to associate in school with anybody who is profane and obscene in their language and habits.

I have brought my children up to be Christians in and out of church. I have taught them to back up their honor and decency by their conduct as well as by their fists.

I do not want them to be exposed to immorality until I have had a chance to prepare them for the temptations of life.

RALPH SHAW, JR.  
Beverly, N.J.

**Fossil fuel tool**

Shame on Bruce H. Frisch ("The 'A-Bomb' on New York's Doorstep," Oct. '63). He is undoubtedly being supported or brainwashed by the fossil fuel industries to discredit nuclear reactors. If the Ravenswood plant is built, it will definitely place coal and oil in bad competitive position. Air pollution from the chemical burning of fossil fuels is a much greater hazard to man than radiation from shielded reactors.

If you are a science magazine, give the public the facts based on engineering and scientific principles and not political hogwash.

JOHN B. BROWN  
Laguna Beach, Calif.

**Unthinking**

In "Inventor of the Month" (Oct. '63), author Stacy V. Jones makes a remark that is misleading. He states, "Machines remember, but they don't think." Machines can think, given sufficient information. In the case in point, it would be necessary only to inform the computer that "a" is not to be capitalized when it is followed by "nd" and not preceded by Mr. This may seem a small point, but it must be remembered that human beings can think, only because they have acquired the necessary information.

G. T. ST-ONGE  
St. John, N.B.,  
Canada

**Sharp question**

In "What Happens When You Shave," you make the statement that whiskers left uncut grow about .17



inch per day, or a half-inch a month. Multiplying .17 inch times 30 days I get 5.10 inches rather than a half-inch—more than a whisker's difference.

It would seem that insofar as the daily figure is concerned, you have a little too much five o'clock shadow . . . or perhaps you have shaved the monthly figure. Not really meaning to beard your editorial staff because I'm sure they take enough on the chin already, but which figure is correct?

AUSTIN L. MYERS  
Garden City, Mich.

*We hacked a zero out of the daily figure—it should be .017. This error cuts us deeply.*—Ed.

### Where to grow old

Regarding Albert Parry's interesting article "How to Grow Old Without Aging" (Oct. '63), about how long people live in Soviet Georgia, I would like to know if there is any area in the U.S. similar to the Caucasus area of Georgia.

M. L. PAYMER  
Baltimore, Md.

*As to exact parallels in American geography, please note that my article refers to several different parts of the Caucasus, and these differ to various degrees in climate, soils, chemical characteristics of the water supply, radiation exposure and many other things that might affect physical energy and length of life. Perhaps the closest parallel to the Caucasus in this country would be the middle slopes of the southern half of the Sierra Nevada, especially on the western side, but again, this is only a very general climatic similarity.*—  
ALBERT PARRY

### Stars in the Bible

Congratulations to Dr. Josef Otoupalik for his excellent letter on the "seven wonders of the sky" (Oct. '63). However, he is in error when he states that the Pleiades is the "only group of stars mentioned in the Bible." A number of constellations are named.

Job 9:9 gives two (Pleiades and Orion) in the King James Version. The American Revised Version and the Revised Standard Version translate "the Bear" for the Arcturus of the King James Version, which makes three. And may not the expression "the chambers of the south" in the verse refer to another star group such as Sagittarius? Still further, it is interesting to note that the Douay version gives us the Hyades instead of the Pleiades in Job 9:9 but retains the Pleiades in Job 38:31. If we allow these translations and interpretations to stand, our total of constellations mentioned in the Bible is nearly half a dozen.

REV. MARK L. MITCHELL  
Stanton, Mich.

"He's covered by Blue Shield."



Char  
Roe

# Bird Bath



First the legs

A FEW months ago one of the marabu storks in the Copenhagen, Denmark, zoo had an infected leg which had to be washed every day. The infection is gone now but




Then the head

the bird has been hooked on the bath habit. It enjoys the baths so much that kindly keepers have been washing it down ever since.

(All photos P.I.P.)





And look  
how nice and clean

## How to test a baby's intelligence





**E**VEN though a baby can't speak, there are still ways of discovering just what goes on in his seemingly unpredictable little mind.

Dr. Arnold Gesell of Yale University, a world famous authority on children, has set up a series of tests drawn from his work that reveal whether a baby's mental development is following a normal course.

These tests, often used when matching infant with parents in adoption procedures, are broken down into four areas:

*Motor*—how the baby moves and how his body is coordinated.

*Adaptive*—the baby's capacity to begin a new experience and learn from a past one.

*Language*—what a baby can communicate and understand.

*Personal-Social*—how a baby responds to other persons and the demands of the culture.

The tests appear simple. For example, when a child's adaptive development is tested for the first time, he plays with blocks. But a great deal depends on the testers, who must evaluate the baby's response.

Lest mothers assume their children are not developing normally because they do not conform to the pattern indicated by the tests, psychologists note that the rate at which skills develop varies from child to child.

The tests shown on these pages were conducted with Dr. H. Michal-Smith of Flower Fifth Ave. Hospital in New York City.

Can baby get a round peg into a round hole?



At 16 weeks, Johnny can hold his head up.



At 24 weeks, he puts new things in mouth.



Chewing rings is OK socially at 32 weeks.



Little spots are interesting at 40 weeks.



At 48 weeks, Billy will offer a little present, but he won't let go—not yet. He can also remove the round block from the round hole on the formboard with ease.



At 52 weeks, Billy is very friendly; he will offer a ball to his image in the mirror. He also has enough motor skill to walk while only holding on with one hand.



At 15 months (left), Regina will drop a pellet into a bottle. At 18 months (center), she can get most of her food inside her, and she likes dropping cubes into a cup.





At 18 months, Regina will confidently climb into an adult chair or begin to draw with a crayon. By the age of 21 months (below), she can build towers six blocks high.





# 1964 BABY

**Statisticians say he'll live at least until 2035. Based on what science has done and will do, here is an authoritative forecast of his life, his work, his health.**

by Daniel Cohen

**C**HANCES are that you—or someone you know—will have a baby in 1964. Four million, two hundred thousand will be born in the United States in the next 12 months (114 million around the world.)

Will a child be lucky to be born in 1964? What will life be like for him? How much education will he need? How much will he get? What kind of job will he have? How healthy will he be? How long can he expect to live? (For specific projections about your own life see page 19).

Statistical projections can give an accurate, if general, picture of what little Mr. or Miss 1964 will face.

Surely, 1964's baby will inhabit a more crowded nation and world than



his parents knew. After adding up births and migrations and subtracting the number of expected deaths, the experts figure the U.S. will have an additional 2.7 million inhabitants at the end of 1964.

When our 1964 baby is 12, he will be living in a nation of 240 million people. By the time he is 36, at the beginning of the next century, the country will have 350 million. Compare this with 180 million in the U.S. today.

And it won't be the same sort of population. The proportion of people below 25 and above 65 is expected to be far higher than it is today. Fortunately, all signs point to one proportion remaining the same. The population will be equally and happily divided between males and females.

Curiously, the birth rate in the U.S., that is the number of babies born per 1,000 population, is falling. It has been for several years. With new methods of birth control being introduced, it is probable that the rate will continue to fall or at least level off at a much lower figure. But the number of babies born is still going up, and it will continue to rise. The reason is simply that the number of women of child-bearing age will increase by over one third during the 1960s. So even if each of these women has fewer children than her older sisters, the total number of babies born in the years ahead will still be greater than at any time in the nation's history.

For the rest of the world, especially the underdeveloped nations

of Asia, Africa and Latin America, the population problem is infinitely more acute. Many of the political and social problems that will worry the 1964 baby, when he reaches the age of worrying, will be caused by the pressure of the skyrocketing population on the world's resources.

Is the future utterly bleak, as some population projections seem to indicate? Is 1964's baby doomed to be drowned in a rushing tide of hungry people, or simply squeezed to death for lack of standing room? Not necessarily.

Robert C. Cook, president of the Population Reference Bureau, an organization that keeps a troubled eye on rising populations, is somewhat hopeful.

"According to the United Nations," he states, "the world birth rate has remained practically unchanged in the last three decades. But the active interest of some of the larger developing nations—India, Pakistan, Egypt, Chile, perhaps even mainland China—in establishing fertility control programs suggests that the world birth rate may begin to decline in the not too distant future. Indeed, in the past ten years there have been dramatic declines in several countries, especially Japan and the Communist countries of Eastern Europe.

"Progress is being made in developing means of fertility control adapted to the needs of people in the developing countries. Effective mass educational programs adapted to these areas are also needed. Whether or not the world birth rate

## There will be plenty of jobs for 1964's baby, providing he has had plenty of education.

will decline in time for these countries to avoid the hunger and privation that loom on their horizons remains a vital question."

Still, there's much we can foresee for the 1964 baby in the U.S.

Certainly his infancy will be safer than ever. In years past, expectant mothers in America were tortured with well-justified fears for the life of their child. As late as 1918 one in ten babes born in the U.S. did not survive its first year. Today, the reasons for this fear have largely vanished. Fewer than three children out of 100 die in infancy.

Of America's 1964 babies, better than 98 percent will enter either a public or private elementary school. And over 80 percent of them will graduate from high school. On the basis of past performance, the experts expect that more girls than boys will graduate from high school. In colleges, however, the male graduates will outnumber the females.

The 1964 baby, or rather his parents, need not worry about crowded schools as much as this generation did, at least at the elementary and high-school level. The classroom shortage reached its peak in 1953-54; since then, an emphasis on school construction has reduced this shortage, and 1964's baby should be able to attend an adequate school.

One trend that has been observed and is expected to continue is the growth in importance of the private elementary and secondary school. In 2000, when the children of those born in 1964 begin attending school, 20 percent of them will be going to private schools. 1964's baby, who will be 2000's parent, will have to find a way of paying for this schooling.

At the college level, things are different. The 1964 baby faces a dual problem: Will there be enough college classroom space, and will his parents be able to afford the ever-rising cost of a college education. Much depends on what government, federal, state and local, does.

Currently almost 60 percent of all higher education enrollment is in public colleges and universities. This percentage, which has been rising for decades, is expected to continue to rise until in the year 2000, when 75 percent of all college students will be enrolled in public colleges and universities.

When 1964's baby enters school he will be entering one of the most crucial stages of his life. Employment opportunities for those with little education and few skills are closing up fast. If 1964's baby goes into the job market without at least a high-school diploma or some sort



of special training, his chances of ever getting an adequate job are slim indeed. Plenty of job opportunities will exist, but the best will be in occupations requiring the most education and training.

Here's the sort of working population that planners see for the year 2000, when 1964's baby will be in the prime of his working life.

### Where the jobs will be

The two fastest growing sectors of the working population will be services, that is everything from doctors to TV repairmen and trade, business managers, salesmen, etc. The services will jump from their current 18 percent of the total employment population to 26 percent and trade will rise from 20 percent to 26 percent. The civil service will be another expanding area. Employees of all branches of government will rise from 10 to 12 percent by 2000. On the other hand, those employed in manufacturing will drop from 25 percent to 19 percent. Even in manufacturing, a strong shift toward highly skilled employees is already evident.

Agricultural employment will fall to a mere 4 percent by 2000. Low as this percentage is, it will represent an increase in the actual number of people working in agriculture, a reversal of a long-term declining trend. Planners attribute the upturn to an expected expansion in foreign markets for U.S. agricultural products. Mining, transportation, communications and finance will all

#### DEATH RATE/PER 100,000 POLICYHOLDERS FROM SELECTED CAUSES

Industrial Policyholders, Metropolitan Life  
Insurance Company, 1960

##### Cause of Death

<b>ALL CAUSES—Total</b> .....	<b>671.2</b>
Tuberculosis (all forms) .....	5.4
Tuberculosis of respiratory system .....	5.0
Communicable diseases of childhood .....	0.1
Acute poliomyelitis .....	0.1
Malignant neoplasms .....	142.4
Diabetes mellitus .....	15.2
Diseases of the cardiovascular-renal system .....	357.1
Pneumonia .....	19.7
Influenza .....	1.8
Ulcers of stomach and duodenum .....	5.2
Appendicitis .....	0.8
Hernia and intestinal obstruction .....	3.8
Gastritis, duodenitis, enteritis, etc. ....	2.2
Cirrhosis of liver .....	11.8
Diseases of the gallbladder and biliary ducts .....	2.2
Complications of pregnancy, childbirth .....	0.6
Congenital malformations .....	3.3
Suicide .....	6.1
Homicide .....	2.8
Accidents—total .....	32.4
All other causes .....	58.2

Spectacular medical advances against the infectious diseases have reduced their toll. Today and in the future the chief killers will be heart disease and cancer.

have a smaller share of the total employment pool in 2000.

A child born in 1964—particularly a boy—will probably spend less of his life in a job than his parents did. He will spend a lot more time in school though. Because of that, planners foresee a gradual decline in the percentage of males

## 1964's baby will start work later, work less hours a week, and retire earlier.

under 25 who will be working. Public and private retirement funds will make early retirement more attractive, so there will also be less men over 55 who work.

Women, on the other hand, will be doing more work. School will also keep many women under 25 out of the job market, for all other age groups, a greater percentage will be going out to work than do today.

The 1964 baby will almost certainly be working fewer hours a week. An average of 30 hours of work a week is predicted by 2000. This may seem a conservative estimate since the 30-hour work week is already being widely discussed, but if 1964's baby is like past generations of Americans, he will value income above leisure time, and the work week will not shrink as quickly as might be expected.

Generally speaking, 1964's baby will probably be moving up in America's affluent society. Most people will be making more money, and their standard of living will be higher. But the changes forecast will also bring tremendous problems. Chief among these is the already major problem of unemployment caused by automation.

The ideal is, of course, that everyone who wants a job should be able to find one. America falls short of

that ideal today, and planners do not expect this sort of full employment to be present when 1964's baby enters the labor market. In recent years, it has been considered that 96 percent employment could be viewed as a high employment economy, even though it is desirable to hold unemployment below the four percent level. This definition of high employment is not expected to change over the next generation.

About one fourth of the four percent unemployed are what is known as "pipeline" unemployed, people who are changing jobs, temporary workers and the like. The remaining three percent are people who have skills that are no longer needed, in industries with declining demands, or in depressed areas.

Who are the unemployed going to be? Dr. Seymour L. Wolfbein, Deputy Assistant Secretary for Employment and Manpower, U.S. Department of Labor, has warned, "So far as unskilled jobs are concerned, they just ain't going to be there."

What about the 1964 baby's health? During the last half century, advances in medicine, public health, and the general standard of living have sharply cut the death rate. Medical science has given mankind increasing control over the infectious diseases, once the chief



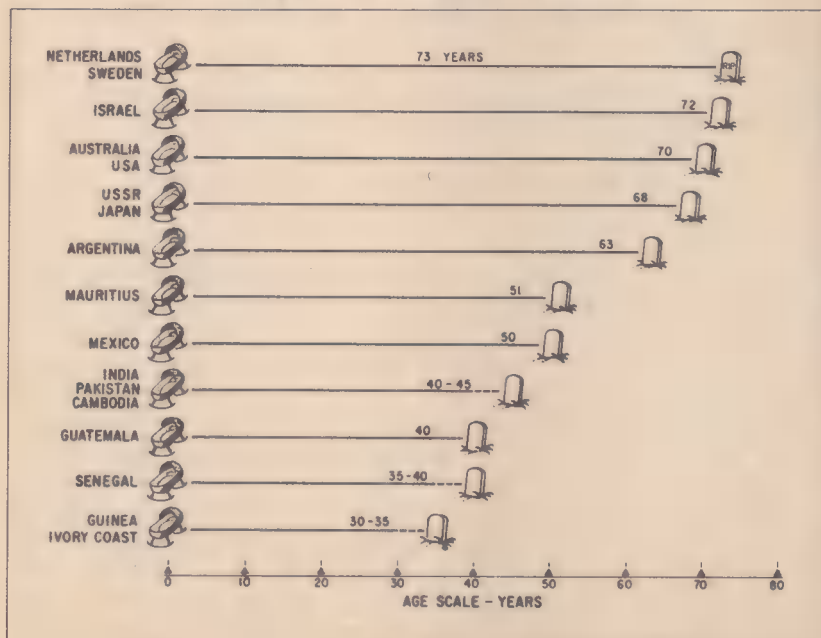
cause of death. Influenza, scarlet fever, polio and the like have become relatively minor menaces, which can, with care, be avoided.

The health prospects of a baby born in America or another modern, industrialized country in 1964 differ sharply from the future facing a baby born in the underdeveloped areas of the world. Doctors already know how to cut the tolls of such killers as malaria and tuberculosis. Yet the experts foresee no dramatic advance for the health of citizens of underdeveloped nations. In fact,

their plight may become even worse.

The reason is simple—overpopulation. If a country does not have enough food to supply its rising population, and the United Nations estimates that right now half the world's people go hungry, then these people will die at an early age. More than hunger is involved. If overpopulation strains a nation's resources, or creates political instability, it cannot institute the kind of public health and sanitation programs that could save lives. In some countries, Guinea, for instance, the

Life expectancy throughout the world



Population Reference Bureau

A baby's chances for a long life depend on the country in which he was born.

average life expectancy is 35 years.

How long can young Mr. and Miss America expect to live? At birth in 1911, the average industrial policyholder of Metropolitan Life Insurance Company (a pretty good statistical model for the population as a whole) had a life expectancy of 46.6 years. For a baby born in 1963, the expected life span is 70.9 years, a gain of over 24 years.

### Three score and ten

The experts don't expect the average lifespan of a child born in 1964 to much exceed 71 years. The reason for the tremendous jump in average life span over the last half century is the spectacular reduction in mortality among children and young adults. Deaths among the young are already at such a low level that no further large reductions are expected. Thus, since 1950 the increase of lifespan has amounted to only 2.3 years.

The Statistical Bulletin of the Metropolitan Life Insurance Co. points out that, "Since 1954, only half a year has been added to the average length of life in the United States, and it appears that the future will bring relatively small further gains."

The age barrier, if we can speak of it thus, seems to hover around the Biblical three score and ten. In order to increase the average life span significantly, breakthroughs will have to be achieved against two diseases—heart disease and cancer.

Between them, these two diseases

account for about three quarters of all the deaths in the U.S. Since both diseases seem to result from a multitude of causes, it seems doubtful that a single discovery will wipe out either of them. The diseases also seem to be linked with inevitable byproducts of modern life—heart disease, with tension, lack of exercise, overeating rich foods and smoking; cancer with air pollution, radioactivity, and again—smoking.

Heart disease, incidentally, kills men earlier than women. A woman living today can expect to live six years longer than a man. The reason is the number of heart attacks among men of early middle age.

Scientists are now beginning to recognize some of the factors that lead to early heart attacks, but none of these factors can be alleviated by a pill or an injection. To guard against heart attacks in early middle age, men must make some basic changes in the way they live. Since this sort of change is most difficult to make, we can expect that women of the 1964 generation will live longer than men born the same year.

Utopia is not around the corner for the 1964 baby, but it never has been for any baby born at any time in history. The big difference is that more and more he will have the knowledge to overcome these problems, and the power to shape his own destiny.

A celestial odds maker would have to rate his chances of long life, health and happiness as very good; 1964 should be a vintage year to be born in.

# How long you have to live

A BABY born in 1964 can expect to live 71 years.

How about you? On this and the following page is a chart showing

the life expectation by race and sex at every year of age from one to 85 in the United States at the present time.

AGE	TOTAL			WHITE		NONWHITE	
	Both sexes	Male	Female	Male	Female	Male	Female
1	71.0	68.0	74.2	68.5	75.0	63.8	68.6
2	70.1	67.1	73.4	67.6	74.1	63.0	67.8
3	69.2	66.2	72.4	66.7	73.1	62.1	66.9
4	68.3	65.2	71.5	65.8	72.2	61.2	65.9
5	67.3	64.3	70.5	64.8	71.2	60.3	65.0
6	66.3	63.3	69.5	63.8	70.2	59.3	64.0
7	65.4	62.4	68.6	62.9	69.3	58.4	63.1
8	64.4	61.4	67.6	61.9	68.3	57.4	62.1
9	63.4	60.4	66.6	60.9	67.3	56.4	61.1
10	62.4	59.4	65.6	60.0	66.3	55.5	60.2
11	61.5	58.5	64.7	59.0	65.4	54.5	59.2
12	60.5	57.5	63.7	58.0	64.4	53.5	58.2
13	59.5	56.5	62.7	57.0	63.4	52.6	57.2
14	58.5	55.5	61.7	56.1	62.4	51.6	56.3
15	57.6	54.6	60.7	55.1	61.4	50.7	55.3
16	56.6	53.6	59.8	54.1	60.5	49.7	54.3
17	55.7	52.7	58.8	53.2	59.5	48.8	53.4
18	54.7	51.8	57.8	52.3	58.5	47.9	52.4
19	53.8	50.8	56.9	51.3	57.5	46.9	51.4
20	52.8	49.9	55.9	50.4	56.6	46.0	50.5
21	51.9	49.0	54.9	49.5	55.6	45.1	49.5
22	50.9	48.1	54.0	48.6	54.6	44.3	48.6
23	50.0	47.2	53.0	47.6	53.7	43.4	47.7
24	49.1	46.2	52.0	46.7	52.7	42.5	46.7
25	48.1	45.3	51.1	45.8	51.7	41.6	45.8
26	47.2	44.4	50.1	44.9	50.8	40.8	44.9
27	46.2	43.5	49.2	43.9	49.8	39.9	44.0
28	45.3	42.5	48.2	43.0	48.8	39.0	43.0
29	44.3	41.6	47.2	42.1	47.9	38.2	42.1
30	43.4	40.7	46.3	41.1	46.9	37.3	41.2
31	42.5	39.8	45.3	40.2	45.9	36.4	40.3
32	41.5	38.8	44.4	39.2	45.0	35.6	39.4
33	40.6	37.9	43.4	38.3	44.0	34.7	38.6
34	39.7	37.0	42.5	37.4	43.1	33.9	37.7
35	38.7	36.1	41.6	36.4	42.1	33.0	36.8
36	37.8	35.2	40.6	35.5	41.2	32.2	35.9
37	36.9	34.2	39.7	34.6	40.2	31.4	35.1
38	36.0	33.3	38.7	33.7	39.3	30.6	34.2
39	35.1	32.4	37.8	32.8	38.3	29.8	33.4



AGE	TOTAL			WHITE		NONWHITE	
	Both sexes	Male	Female	Male	Female	Male	Female
40	34.1	31.5	36.9	31.9	37.4	29.0	32.6
41	33.2	30.7	36.0	31.0	36.5	28.2	31.7
42	32.4	29.8	35.1	30.1	35.6	27.4	30.9
43	31.5	28.9	34.2	29.2	34.6	26.7	30.1
44	30.6	28.1	33.3	28.3	33.7	25.9	29.3
45	29.7	27.2	32.4	27.5	32.8	25.1	28.5
46	28.9	26.4	31.5	26.6	31.9	24.4	27.7
47	28.0	25.5	30.6	25.8	31.0	23.7	26.9
48	27.2	24.7	29.7	25.0	30.1	22.9	26.2
49	26.3	23.9	28.8	24.1	29.2	22.2	25.4
50	25.5	23.1	28.0	23.3	28.4	21.5	24.7
51	24.7	22.4	27.1	22.6	27.5	20.9	24.0
52	23.9	21.6	26.3	21.8	26.6	20.2	23.3
53	23.1	20.9	25.5	21.0	25.8	19.6	22.6
54	22.3	20.2	24.6	20.3	24.9	19.0	21.9
55	21.6	19.4	23.8	19.6	24.1	18.3	21.2
56	20.8	18.7	23.0	18.8	23.2	17.7	20.5
57	20.1	18.0	22.2	18.1	22.4	17.1	19.9
58	19.3	17.3	21.3	17.4	21.6	16.5	19.2
59	18.6	16.7	20.6	16.8	20.8	15.9	18.6
60	17.9	16.0	19.8	16.1	20.0	15.3	18.0
61	17.2	15.4	19.0	15.5	19.2	14.8	17.4
62	16.5	14.8	18.2	14.8	18.4	14.3	16.9
63	15.8	14.2	17.5	14.2	17.6	13.9	16.4
64	15.2	13.6	16.8	13.6	16.9	13.4	16.0
65	14.6	13.0	16.1	13.1	16.1	13.0	15.5
66	14.0	12.5	15.3	12.5	15.4	12.7	15.0
67	13.3	12.0	14.7	12.0	14.7	12.3	14.5
68	12.8	11.5	14.0	11.4	14.0	11.9	14.0
69	12.2	11.0	13.3	10.9	13.3	11.6	13.5
70	11.6	10.5	12.6	10.4	12.6	11.2	13.0
71	11.0	10.0	12.0	9.9	12.0	10.9	12.5
72	10.5	9.5	11.4	9.4	11.3	10.5	12.1
73	10.0	9.0	10.8	9.0	10.7	10.2	11.6
74	9.4	8.6	10.2	8.5	10.1	9.8	11.1
75	8.9	8.1	9.6	8.0	9.5	9.4	10.7
76	8.4	7.7	9.0	7.6	8.9	9.1	10.2
77	8.0	7.3	8.5	7.2	8.4	8.7	9.7
78	7.5	6.9	8.0	6.8	7.9	8.3	9.3
79	7.0	6.5	7.5	6.4	7.4	7.9	8.8
80	6.6	6.1	7.0	6.0	6.9	7.5	8.4
81	6.2	5.7	6.6	5.7	6.5	7.1	7.9
82	5.8	5.4	6.1	5.3	6.1	6.6	7.5
83	5.5	5.1	5.7	5.0	5.7	6.2	7.0
84	5.1	4.8	5.4	4.7	5.3	5.8	6.6
85	4.8	4.6	5.0	4.5	5.0	5.5	6.1

# The Chunnel— a new Channel tunnel idea

by James H. Winchester

While Britain and France may differ about the Common Market, and a few other things, the old idea of connecting the two nations by a tunnel under the English Channel is moving toward reality.

**T**HE century-and-a-half-old dream of a submarine land link between England and France is nearing reality. A White Paper by an official British and French government committee has welcomed the construction of a railroad tunnel under the English Channel as a sound proposition, economically and technically.

The report, delivered in September after three years of study, discarded the idea of a bridge or combination tunnel-bridge link. The tunnel, the experts said, would cost \$400 million—about half the cost of a bridge—take six years to build and would be cheaper in the long run than expansion of air-sea services to carry the increasingly heavy traffic.

A model of the English end of the proposed Chunnel shows entrance with two single-line tunnels and small maintenance tunnel between. Special rail cars will transport autos.



It would handle both train and auto traffic. Passenger and freight trains would roll on fast, regular schedules. Autos would be carried through the tunnel on specially-built railroad cars, just as they are now through the Simplon and St. Gotthard Tunnels, beneath the Swiss Alps. Each train would carry 300 cars.

With the engineers in agreement, political implications and final financing have to be debated, but here, too, the climate is favorable. President de Gaulle has already blessed the scheme. The British Parliament, where sentiment for the project is high, will vote on its nation's participation early in 1964. Financiers, including some of the world's largest banks, are standing in line to invest their cash.

Ready to set up an international company to build "The Chunnel," as it's being called, is a British-American-French consortium of companies, which has already spent more than \$1.5 million in the last five years on new economic, geological, engineering and other aspects of the project. Members are Britain's nearly century-old Channel Tunnel Company, Technical Studies, Inc., of New York City, Compagnie Financiere de Suez—the firm that built, owned and operated the Suez Canal before it was nationalized—in which the British government has a one-third interest, and the French Tunnel Company, with its associate, the International Road Federation.

The official Anglo-British study group, in its report favoring con-

struction of the tunnel, says that transportation of freight through the tube would be only one-half present English Channel ship charges. A forecast is also made of peak auto traffic of 2,600 vehicles an hour by 1980, about one-fourth of the tunnel's capacity. Trains could make nonstop trips between London and Paris in four hours and 20 minutes. Officials predict a huge increase, with the opening of the tunnel, in tourist trade for both countries. "A lot of people are afraid of traveling by sea or air," says a London travel aide. "But they will go on holidays both ways if they can get there on wheels."

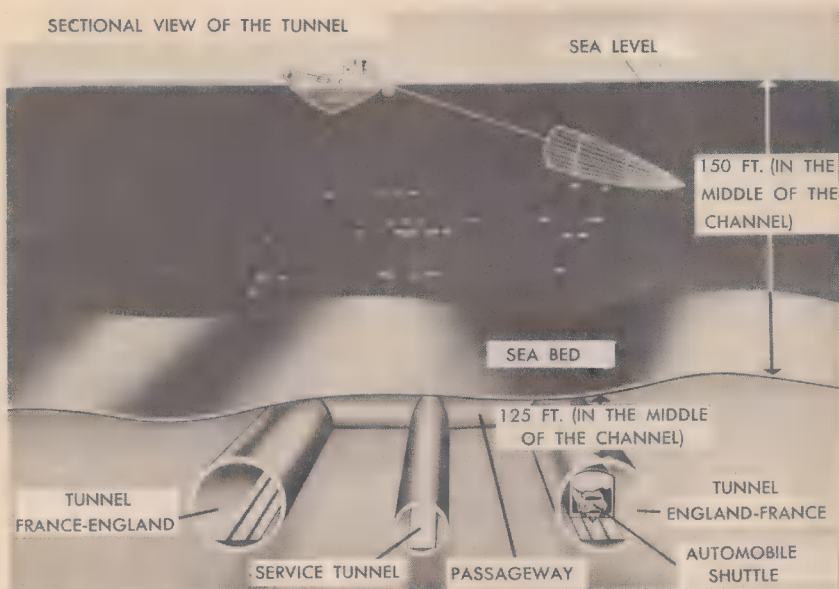
### Short trip and a hard one

It was the very unpleasantness of an English Channel crossing by ship—and nothing can be more unpleasant when this relatively shallow stretch of water is kicking up, as it often does—that led to today's revival of action on a tunnel to connect England and France.

It was back in late 1956 that two New York City lawyers, Cyril C. Means, Jr., and Frank P. Davidson, met for lunch. Over coffee, Davidson, who'd recently returned from a European trip with his wife and two children, described their crossing of the English Channel. What was ordinarily a two hour trip took seven hours in the rough weather. "I'll never be able to convince my wife to cross the Channel again unless they build a tunnel," Davidson said ruefully.



SECTIONAL VIEW OF THE TUNNEL



The Channel tunnels are expected to reach a depth of 125 feet below the seabed. A service tunnel will be driven ahead of the main tunnels to facilitate their construction.

## How the Chunnel will work

Proposed construction of the Chunnel will be between Dover and Calais, slightly south of the two towns. It will cut London-to-Paris travel time to about four hours.



Cars leave flatcars during a demonstration run in France. Such trains, to be utilized in Chunnel operations, have been used successfully for 10 years in the Alps.



## Plans for a tunnel under the cold, grey angry stretch of water inevitably wound up against the rock of British insularity—until 1955.

Back in his office, Means, thinking about his friend's comment, mused: "Well, why wouldn't a tunnel be practical?"

When he started looking into the matter, Means found that in 1802 a French engineer named Mathieu submitted to Napoleon a plan for a carriageway contained in a tunnel to be bored under the Straits of Dover. Since then substantial time and money have been spent on the idea by a lot of responsible people. Operating companies formed and actual starts, from both sides of the cold, grey angry stretch of water, were made.

All of these dreams, however, eventually wound up against the rock of British insularity. Now things have changed. The airplane, and more particularly Hitler's V-bombs, caused Britons to realize that what had been a barrier in the path of invasion for centuries had become a myth. In 1955, Harold Macmillan, Great Britain's former Prime Minister, then Defense Minister of the United Kingdom, finally ended the long history of British objections to a Channel Tunnel on strategic grounds. He said in answer to a question in Parliament as to whether the Government would have objections of a military nature, "Scarcely at all." Stock in the long

dormant British and French Tunnel Companies, hardly worth the paper it was printed on, immediately shot skyward and stayed there.

Fired with enthusiasm, the two lawyers formed a company, Technical Studies, Inc., with Davidson's brother-in-law, Arnaud de d'Avaucourt—a graduate of France's Ecole Polytechnique and a senior engineer for a major U.S. oil company—as chairman, to reopen studies and interest in the project. They joined forces with the long inactive English Channel Company, the French Tunnel Company, and the Suez Company. Working together they formed the Channel Tunnel Study Group in 1957.

### More and more crossings

They found, that in eight years, up to 1960, the number of passengers crossing the Channel by sea and air had jumped nearly 150 percent, that accompanying motor cars had risen more than 200 percent, and freight had increased by 55 percent. In the period 1962 to 1982, they forecast, even these figures would increase by 55 percent for passengers, 70 percent for cars, and 33 percent for freight.

The Study Group's engineers proposed to construct two parallel rail-

way tunnels, bored beneath the bed of the Channel, for a distance of 32 miles from a point just south of Dover, in England, to a point just south of Calais, at the village of Sangatte, in France.

### Chunneling under the Channel

They would reach a depth of 125 feet below the seabed. Each tunnel would be 21 feet four inches in internal diameter, with cross-passages and cross-over rail junctions. A service tunnel of 10 feet 10 inches internal diameter would be driven between and ahead of the construction of the main twin tunnels to test the geological features and to assist the construction. When the main tunnels are in operation, the service tunnel will be used for maintenance and drainage, and to carry telegraph, telephone and power lines.

Ventilation in the tunnel would be assured by the piston effect of the trains pushing out the air ahead and pulling in new air with the vacuum formed in the rear. Supplementary fans would augment the supply of fresh air. In the event of a train breakdown in the tunnel, passengers will be able to leave the completely enclosed flatcars, on which their cars are locked, and proceed to this central service tube through passageways located at frequent intervals. Also, a motorized first aid service will be maintained in the service tunnel, able to speed to the location of any mishap which might tie up the rail tunnels.

Through these tunnels, the engi-

neers say, railway trains can transport 3,600 automobiles an hour on flat cars, or 7,200 cars in both directions in peak periods.

"Judging from experience in the St. Gotthard and Simplon Tunnels in Switzerland," writes travel-transportation expert Trevor L. Christie, "it is estimated that it would take 10 minutes to load 300 cars, 10 minutes to unload them, and 45 minutes for the train to make the 44-mile run from terminal to terminal."

Each of these terminals, according to Christie, would be a complex of hotels, motels, restaurants, garages, parking and recreational facilities for those who might wish to break the journey. Non-motorists, he says, would be carried on express passenger trains between London and Paris, or other cities. Freight would be handled on separate trains.

### Napoleon had the option

The plan for an English Channel tunnel is an old one in engineering history. The proposal to Napoleon by Mathieu, and another, submitted in 1803 by another engineer, Tessler de Mottray, who proposed laying sections of large-diameter iron pipe on the sea bottom, never got off the ground—or under the water—so to speak. Neither did such other schemes, over the next half-century, as viaducts, jetties and even a double jetty enclosing a canal. In the 1860s there was lots of talk of a tunnel bridge.

In 1872, however, actual companies to build a channel tunnel



were set up in both England and France. Their studies were the first to establish that the formation below the bed of the Straits of Dover is easily-bored chalk, making tunneling through it for long distances relatively cheap and feasible.


By 1883, when the British government, mainly for strategic reasons, ordered the Channel Company to stop work, a tunnel of over one mile in length had already been dug out from the cliffs of Dover. A similar length of tunnel had been pushed out from Calais. Both these holes beneath the sea are still in existence and would be used in the construction now planned.

There was a serious effort in the

1920s to revive the project. The military blocked it again, even though Winston Churchill was strongly for it.

During World War II both the British and the Germans kept seismo-radar teams in these shafts to listen for borings, just in case either side decided to try and complete the tunnel as a secret gateway to the other's shores. Neither side ever tried it, though.

Today, with military objections out of the way, the "Chunnel" may soon prove to be the instrument that will enable Britain and France—who haven't been able to get together on too much recently—to finally make ends meet.



### *As cold as Greenland? How cold was that?*

**W**HEN Leif Ericson and other Viking explorers found themselves in Greenland, they must have had some cold weather to contend with. Science has found a way which may soon tell us just how cold it was.

Because the surface of the snow becomes the same temperature as the air, it is possible to take the temperature of deep layers of snow and find out about the climates of the past. Glaciologists are drilling deep into polar ice and snow and extracting samples that may give information about the wetness and the coldness of the season in which the layer was formed. Preliminary analysis of cores obtained gives detailed data on the climate of Greenland for the past 600 years, and of Antarctica for about 2,000 years, because there is less precipitation there.

One benefit of the studies is that an understanding of the mechanisms that change our climate may be the key to control of the weather and the sea level.

Examining old ice beds is like examining rock beds. One difference is in the time it takes the layers to form. A rock stratum is laid down in thousands of years; a snow stratum is deposited each season. Summer snow is different from winter snow. By measuring density and snow grain size, one season's snow can be distinguished from another. Measurements of density and grain size give information about changes of climate in the past, while temperature measurements tell how the weather is changing today.



## What ails that-hic-phrenic nerve?

by O. A. Battista

**People have been hiccuping since ancient times, prompting an endless assortment of remedies. Some of them—science finds—may actually work.**

**T**HE hiccup is an affliction so old that the ancients mentioned it on stone tablets.

Science knows what a hiccup is, but can't explain why one may plague you today and not next week. Researchers are often stymied in their attempts to start a hiccup, and medical men sometimes despair of being able to stop one that nature has somehow started.

One of the earliest recorded chronic hiccuppers was the Greek playwright Aristophanes. And the venerability, if not the reliability, of several popular remedies for hiccups is evidenced by the fact that the playwright, in the years around 400 B.C., tried holding his breath and

gargling water—both to no avail. Finally he happened on the trick of tickling his nose until he sneezed. And this, we are told, was a panacea for Aristophanes' hiccups.

But thousands have been similarly plagued since the days of this dramatist, and hundreds of home-made cures continue to be suggested. As Dr. Charles Mayo wrote many years ago, "Perhaps one is justified in saying that there is no disease which has had more forms of treatment and fewer results from treatment than has persistent hiccup."

According to Webster, a hiccup, or hiccough, is, "A spasmodic inspiratory movement, consisting of a

## One lass's dating problems led to hysterical hiccups and hospitalization until a doctor tried common sense

sudden contraction of the diaphragm, accompanied with closure of the glottis, the inrush of air against the closed glottis producing a peculiar sound."

A hiccup, for your further information, results when an irritation or inflammation disturbs the phrenic nerve—a nerve which runs down the back of your neck from the top of the spinal cord. The phrenic nerve is boss of your diaphragm, the large breathing muscle that stretches like a sheet between chest and abdomen. The diaphragm, which controls expansion and contraction of the lungs by its rhythmic movement, receives impulses controlling its action from the brain via the phrenic nerve.

In response to the phrenic nerve's usual steady signals, your diaphragm expands to let you inhale, contracts to let you exhale. Normally, every time you inhale, the diaphragm executes a smooth, comfortable contraction in response to messages that come to it regularly from the brain through the phrenic nerve.

But anything that irritates the diaphragm can make it twitch; so can anything that irritates that part of the brain where the respiratory center lies. And the respiratory center receives messages from many parts of the body where trouble may exist.

The physician, given a case of

persistent hiccups, has to consider whether the trouble is in the diaphragm itself, or somewhere along the course of the phrenic nerve, or in the neck region of the spinal cord, or in the lower part of the brain (*medulla oblongata*), or even in remote parts of the body that have nervous connections with the brain. That is why the solution of a case of hiccups may require real detective work, and why, in rare instances, it may actually baffle the skill of the physician.

Hiccups can come on after an attack of influenza, sleeping sickness, kidney trouble, appendicitis, uremia or a score of other conditions. They can also occur after an operation. It is even believed that certain types of hiccups can be "contagious," and indeed there have been epidemics of hiccups.

### Date with a hiccup

Some stubborn types of hiccups have been found to be psychological in their cause. "Hysterical hiccups" are initiated by emotionally disturbing experiences. Although they are usually of short duration, they may at times persist for months.

A young girl, who frequently had heated disagreements with her father, suffered a severe attack of hysterical hiccups after a dispute about "going out with boys." When the



hiccups failed to go away, her parents tried all the known remedies, including some that were dangerous. Still she kept hiccuping.

At last she was taken to the hospital. During the first few days her doctor tried various forms of physical treatment with no success. Then, since he could determine no organic cause for her condition, he ceased all treatment and resorted to a few mild suggestions on obedience and understanding. In a short time the hiccups vanished.

Some hiccups have made medical history. One young lady, for example, hiccuped for 47 days; still another for three years before obtaining relief.

It's not unusual to find newspaper headlines detailing some exceptional hiccups or hiccupers.

Scarcely three weeks of hiccuping in 1935 killed 70-year-old Frank E. Owens, mayor of Galena, Illinois. And in a Saratoga Springs hospital, J. McCormick Beeten succumbed after 4½ days of hiccups. Edward O'Connor, a policeman in Butte, Montana, got a big "hic" out of a fellow cop's joke. His laughing started a six-month's siege of unrelenting hiccups that led to his death. A similar, but much longer attack killed a certain William C. Wells of Dayton, Ohio.

Actually, Dr. Roland K. Wright tells me, "The most popular and frequently beneficial rule-of-thumb cure for hiccups is the oxygen-dispersion or "paper bag" cure. The subject covers his head with a paper bag and rebreathes the carbon di-

oxide gas exhausted from his lungs. This has a sound scientific basis, inasmuch as it relaxes the nerves and the muscles by cutting down the supply of oxygen in the bloodstream. A danger in this home-remedy when it is self-administered is that you may faint from lack of oxygen. It is much safer to have a physician apply the same principle by placing a mask over your face and having you breathe a mixture of carbon dioxide and oxygen."

Here is an assortment of the remedies frequently advanced as fool-proof cures for hiccups: freeze your ears; wish on an inverted tea-cup; have someone scare you; count backwards; have someone bounce on your stomach; drink water from the far side of a glass while spinning in a circle, or from two glasses of water at a time; apply cold pennies to the back of the neck; stroke the skin with a hot curling iron; clutch the earlobe for five minutes while spinning around.

Then there was this advice printed in an old Boston newspaper: "Hold your breath and count to 100. If that doesn't work, count to 1,000!"



# If you were a midget

by Andrew Hamilton

**I**F YOU were a midget, you'd be in select company. You'd be one of the 3,000 "little people" in the world—midgets and dwarfs—whose height is less than 4 feet, 6 inches when fully grown.

What would life be like?

You'd be stared at and talked about as small people have been throughout history. But you'd also find that in recent years "little people" have become more than mere curiosities and have begun to live useful lives.

You'd find, too, that few people know the difference between midgets and dwarfs, but that medical science is beginning to discover new facts about what made you so small.

Dwarfism is a medical term that covers both midgets and dwarfs. But there are differences. If you were a midget, you'd be a perfectly proportioned individual, except you'd be about half-pint size. Dwarfs, on the other hand, have nearly-normal-sized bodies, but their limbs are shortened or perhaps twisted and their heads are sometimes misshapen. Pygmies are not considered dwarfs; they average about 4 feet 11¾ inches and nearly six inches more than dwarfs, and they inherit their stature.

Abnormally small human beings appear in about one out of every 1,000,000 births and among all the races on earth.

Dwarfs are mentioned in the Bible, the literature of ancient Greece and in old Norse legends. But medical science did not take much interest in dwarfism until late in the 19th century. Even today information on the subject is scarce.

## The mystery of growth

This may be because knowledge of normal growth is still somewhat of a mystery—whether it be in human beings, farm animals or plants. Scientists have classified kinds of dwarfism in several ways. Broadly speaking, the rate and duration of an individual's growth depend upon three principal factors:

1. Genetic or constitutional background
2. Nutritional status
3. Growth-regulating secretions of the endocrine glands (such as the pituitary, thyroid, adrenal, testis, ovary, etc.)

Most doctors are agreed that dwarfism may result from more than one factor. It may be due to a wide variety of genetic defects, nu-



Miss Anita (above) 22 inches tall, is billed as the smallest woman in the world.



Four-foot Earl "Big Boy" Wallman switched from page boy at a supper club to mechanic at Lockheed Aircraft.

The most famous midget in the U.S. was showman Barnum's dapper circus star, General Tom Thumb (right).

Donald Davidson (below), 4 feet 2 inches tall, has been mascot, bat boy and public relations director for the Milwaukee Braves.





## World War II was a dramatic turning point for undersized men and women. Many quit the entertainment world for defense jobs.

tritional lacks or endocrine deficiencies—or from a combination of these factors.

Genetic dwarfism usually occurs in children of normal parents. At birth, the child may be small and may develop slowly until growth stops altogether. When the child reaches maturity, however, the skeleton is small but in proportion and sexual development is normal.

Chondrodystrophies, disorders in cartilage and bone development, may also lead to a stunting of growth. A doctor can diagnose such conditions by detecting skeletal deformities.

### A question of appetite?

Nutritional dwarfism may result from such diseases as rickets (due to a lack of Vitamin D) or from a shortage of calories (produced by intestinal or liver diseases). Kidney disorders and hepatitis may also slow down growth. However, poor appetite alone does not cause dwarfism.

Endocrine deficiencies as a cause of slow growth have received considerable attention in recent years. Lack of pituitary and thyroid hormones are thought to be the chief causes of dwarfism, but a shortage of sex hormones is also suspect.

The pituitary dwarf has a small but proportioned skeleton, with sexual development coming late. Hypothyroid dwarfism is marked by a slow mental development. Gonadal dwarfism causes early sexual development and premature stoppage of growth.

Dwarfism is sometimes not detected until the age of 8 or 9. Endocrinologists can advise parents whether a short boy or girl is suffering from dwarfism or is naturally a slow grower. If the trouble is glandular, he can prescribe treatment that may correct the condition.

In three out of five marriages, midgets and dwarfs mate with their own kind. But, surprisingly, two out of five marriages are with "big people." Some of these Lilliputian-Gulliver unions are successful—some are not. A St. Louis woman, for example, filed for divorce from her 4-foot husband "because he stood on a chair and punched me in the eye."

Dwarfism is not usually hereditary. In most cases, children of little people turn out to be of normal size. Because of their small bodies, however, midget mothers almost always have to undergo Caesarian surgery. Robert and Judith Skinner of England, both little more than 2 feet tall, hold the world's record as midget parents—14 healthy, normal-

sized youngsters. Midget offspring of midget parents are extremely rare. But history records a few cases.

Most midget children stop growing somewhere between the ages of 2 and 10. But occasionally, after reaching adulthood, they may take an upward spurt again. Perhaps the most astonishing instance of late growth was that of Eddie Wilmot of Minneapolis. At 18 he was the star of a midget show troupe. Then, mysteriously, he began to add inches and 10 years later he was a 6-footer.

Four feet, 6 inches is considered to be the upper limit of the midget-dwarf classification. Most adult little people, however, are in the 3- to 4-foot range. The smallest known adult midget on record was Pauline Musters of Holland, who stood 1 foot, 7 inches high. She was 12 inches long at birth and grew only 7 inches during her entire lifetime. Juan de la Cruz of the Philippines called himself "the world's smallest father." He stood exactly 24 inches high.

### Full-sized eaters

Because their metabolism is about one and one-half times that of an average-sized person, a 60-pound midget can stow away as much food as a 175-pound man and sometimes drink him under the table.

Little people are surprisingly resistant to infectious diseases, tooth decay and baldness. The only ailment to which they seem suscepti-

ble is anemia. A widespread belief exists that midgets and dwarfs are short-lived, but this is not true. Mrs. Charles Stratton, wife of General Tom Thumb, America's best-known midget, died at 78. The oldest midget on record was 23-inch tall Le Petit M. Richebourg of Paris, who lived to the ripe age of 90.

Generally, midgets and dwarfs have been shunned, scorned and ridiculed. Ignorant European peasants considered such children to be heaven's curse. They beat or hid the youngsters from view. For centuries, the only possible livelihood was that of a circus, theater or carnival freak.

But here in the United States (and to some extent in England), World War II proved a dramatic turning point for many undersized men and women. For the first time they were able to quit the entertainment business and go to work in aircraft factories, shipyards, defense plants and government offices.

"We proved we could handle many jobs as well or better than big people," declares Earl J. "Big Boy" Wallman, a flight test instrumentation mechanic at Lockheed Aircraft Corporation in Burbank, California. "You should see our absentee record—almost nil."

His own experience is typical. In the late 1930s, he served as page boy and greeter in a Duluth supper club—a freak attraction that drew customers. The pay was good and the life was soft. But Earl, as he puts it, "felt like a trained mon-

**"Unless you've been ogled and pointed at, you can't imagine the happiness there is in being accepted as a normal person."**

key." In 1941 he came to California and found a job at Lockheed. Bantam sized, he could crawl inside wings and fuel tanks to inspect riveting. In spite of 100-degree heat in summer and cramped muscles the year around, he stuck with his new trade.

"Unless you've been ogled, pointed at or whispered about," he says, "you can't imagine the happiness there is in being accepted and living like a normal person."

Plenty of little people are still in show business. But each year more and more are deserting.

Barry Holbrook, 42 inches tall, one of the smallest lawyers in the United States, served for several years as Director of the Inspection Division of Georgia's Department of Labor. A boyhood fall dislocated both hips and he stopped growing. It was then he decided to become a lawyer.

In Surbiton, England, three midgets—Charles Young, Steve Kochanski and Teddy Kiss—wearied of their vaudeville act. They pooled resources and bought a grocery store. Though they had to stand on boxes to wait on customers, they had the time of their lives.

Eugene David, an expert pipefitter only 40 inches tall, helped to build atomic energy installations at

Shippingport, Pennsylvania and Savannah River, Georgia. "My Paycheck feeds a lot of mouths," says David, grinning. "A wife and five kids!"

Other little people are employed as house painters, supermarket operators, commercial artists, industrial engineers, secretaries, valets, telephone operators, salesmen, advertising men, machinists and a host of other jobs.

### **It's a small world**

In 1957, several score midgets and dwarfs met in Reno and organized the Little People of America. Today Dennis Binion, a 3-foot, 4-inch inspector for the U. S. Internal Revenue Service in Atlanta, Georgia, serves as president. The organization's purpose: to make a better world for all the half-pints and shorties.

"America has made enormous strides in accepting and employing the blind, the deaf, the crippled and the epileptic," said Binion. "We little people think we deserve the same break."

And when science really solves the riddles of heredity, nutrition and endocrine glands, all the problems of midgets and dwarfs may go the way of the dodo and the dinosaur.



Linemen, trained all their lives to avoid contact with a hot line, are now learning a new technique which allows them to grasp . . .

## 775,000 volts with bare hands



For the story,  
turn the page ►

by Andrew Hamilton

FROM Zeus' thunderbolts to Sing Sing's electric chair, man has learned that electricity can terrify, stun, burn and kill. Few have greater respect for electricity than linemen working on high voltage lines with rubber gloves and special tools attached to insulated hotsticks.

Yet birds can perch safely on a hot line. This is because they are not in contact with the ground. They become energized at the same voltage as the line itself—and current cannot flow when there is no difference in potential between two points.

Some 18 years ago, Harold L. Rorden, a veteran high-voltage practices engineer, worked out a method of making linemen "safe as the birds" even when working with 775,000 volts—the highest known transmission voltage. But until three years ago, he was unable to put his theory into practice.

However, with the introduction of an aerial lift truck, with a fiberglass insulated boom—to replace the metal boom of earlier lifts—a lineman could be effectively out of contact with the ground.

The technique was tested with a fiberglass bucket, hoisted into the air by a long fiberglass boom mounted on a truck. The bucket was lined with metal mesh which, when connected by clamps to the energized line on which the men worked, energized the screen and the bucket's occupants at the same voltage as the hot line. Safety was provided by the insulated boom which

protected the men from the voltage between the ground and the wire.

While this new device allowed workmen to take off their rubber gloves, they had to put on special shoes with conductive soles to establish a firm contact between the screen and hot line.

What does it feel like to handle these voltages—thousands of times more powerful than the voltage of your electric light socket?

At the highest voltages, Rorden points out, if a high degree of shielding is not provided, there is some physical sensation because the body serves as a path for the charging current to enter the air.

"It's a prickly skin sensation, not at all like electric shock," he says. "Hairs on the forearms and at the back of the neck straighten out and you feel as if you're standing in a stiff breeze."

For the higher voltage lines, a screen was designed to surround the entire bucket except on the side facing the hot line.

"This is a partial adaptation of what is known as the Faraday cage," Rorden says. "In 1837, the British physicist Michael Faraday demonstrated that you could be inside a completely enclosed metal container, insulated from the ground and energized at high voltage, without receiving an electric shock."

To a lineman, trained all his life to avoid high-voltage contacts, grasping a hot line with bare hands seems—at first—like reckless folly. But demonstrations and careful explanations by veteran barehandlers



Like birds on a wire, these linemen are effectively out of touch with the ground, held aloft by a special insulated fiberglass boom. The boom, mounted on a truck, replaces the metal booms previously used.

have managed to calm their fears.

But there are certain precautions that must be observed, just as there are when working on hot lines by any other method. When working

barehanded on high-voltage power lines, brushing against trees, wood poles, steel towers or anything else connected with the earth must be avoided. Tools usually are in the



bucket before going topside. However, when other tools must be picked up from the ground, special safety precautions are taken.

Extensive laboratory tests indicate that fog, overnight dew and even light rain are not hazardous, but more tests are under way.

Officials of American Electric Power System (AEP) where Rorden's technique was developed, declare that at least four benefits will result from the new procedure:

1. Elimination of line repair interruptions. Under old methods utilizing rubber gloves and/or insulated hotsticks, it was sometimes necessary to take lines out of service for repairs. Now linemen can make barehand repairs without shutting off any householder's electricity—even momentarily.

2. Greater safety than in conventional high-voltage work, provided, of course, that proper training of linemen is carried out. Rorden is careful to point out that there is no such thing as absolute safety. "Practices that are considered 'safe' involve an acceptable degree of risk. The greatest hazard in most industries is human failure and we must protect ourselves against our own negligence. Knowing what I do about the barehand technique, I

would rather trust my life to it than to the conventional method."

3. Reduction of line maintenance costs. Manhours on barehand repairs range from one third to one fiftieth of those required by conventional methods. On 50 typical jobs performed with the barehand method, one crew saved an estimated \$48,000 in manhours.

4. Simplified working conditions. For years, linemen have worked on hot wires with special tools attached to long insulated hotsticks—all the while clinging to wood poles or steel towers with their movement restricted by their safety belts. Such working conditions were made more difficult by necessary safety procedures. Now, linemen can stand in front of the hot line and work on it comfortably.

Says Philip Sporn, former president of AEP, "The engineering principles of the barehand technique are not new—only the special equipment, the routines and the manipulations are novel. But this in itself represents one of the most important developments in the history of electric power maintenance. It demonstrates that, while electricity can be a terrifying man-killer, it can also be a willing servant when properly handled."

## WARNING

**Do not—repeat not—try the barehand technique of handling electricity in your home. This is a job for trained experts only. The voltage in your household's electric system is nowhere near the voltage of giant transmission lines. But it can kill you just as surely if you don't treat it with respect.**

# What you don't know about milking cows

by Fred E. Breth

Dairy farmers have become skillful plant managers whose cunning knack of playing on the psyche of cows with automatic rewards produces a torrent of milk.

**A**UTOMATION has caught up with Bossy, the cow.

She may still be the friendly, slow-moving animal she has always been. Her main occupation may still be eating, regurgitating and chewing, but otherwise, everything is

different: her home, her food, her anatomy, her milking, everything.

It started right after the end of World War II.

The shortage of skilled help started to bear down on the dairy industry. Hand milking was one of

Scientific dairy techniques have found the answer to making the automated cow a contented cow, after subjecting her to all sorts of labor-saving experimentation.



the very first chores to give way.

Conventional milking machines, consisting of a metal bucket and a pulsating unit connected to a vacuum line with a central suction pump, were known long before World War II. In a "stanchion barn," the operator milked each cow in a stooped position, doing kneebends. If he used cans, this, too, required considerable muscle.

The next step in the simplification of milking was the pipeline and bulk tank. The operator still had to do kneebends, but less frequently. And he did not have to carry cans.

A further development, the milk-parlor, eliminated all kneebends. The principle of the milk parlor was if you don't want to creep under them, all you have to do is to get 'em in the air.

Cows were lined up so that the operator standing in a pit below could get to them from underneath. The number of cows that one man could milk increased substantially and the work was less strenuous.

But something was missing.

Cows, though creatures of habit, are very sensitive living beings, and if there is something they don't like, they refuse to milk.

Milk "letdown" is actually beyond the control of the animal, but the psychosomatic reaction of "stress" will inhibit the flow of prolactin hormone which, in turn, will stop the milkflow from the "alveoli."

It is this particular sensitivity of

dairy cattle that has been the major obstacle to the mechanization of dairy-farming. Other farm animals, for example chickens, produce in artificially lighted, windowless houses, in cages or batteries, under fully automated feeding and watering conditions, just as well or even better than when roaming freely.

Not so the cow. To get the milk out of her, Bossy wants to be treated as an individual. She wants a certain amount of grain (in addition to free choice of roughages, *i.e.* hay and silage), and she'd rather see the same face around her all the time.

Mechanization abhors individuality; mass output and special wishes just don't go together. Yet this was the problem, and it was solved.

### California's automated cows

I saw the results of such automation not long ago at one of the world's most modern dairy "factories," the Sherman Thomas Ranch, near Madero, California. I say "factories" because one of the latest things in dairy farming is the separation of animal production from crop-raising. Just as chicken farmers have given up growing grain for their birds, dairy farmers are now beginning to use all their land for "green-feeding," feeding of roughages freshly chopped, buying all grain and hay as needed.

At the Sherman Thomas Ranch, a sprawling complex of feedlots and buildings on the outskirts of Madero, a prosperous town in the San

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Fred E. Breth is editor and publisher of *American Agricultural News Digest*.





Modern cows still find that individuality is respected. Separate loafing stalls feature rubber mats for reclining after a hard day's milking, metal roofs for coolness.

Joaquin Valley, the number of cows milked twice a day may already have reached 2,000. At least that was the plan of the owner in building a third milk-parlor.

When I visited the ranch, 1,500 cows were being milked, and the yearly milk output had reached 22,341,000 lbs. (10,388,500 qts.).

The average milk production was 15,591 lbs. (7,103 qts.) for each cow in 1962/1963. Such a production average would be considered excellent even for a small herd with top management, where each cow gets a lot of individual attention. The yearly U.S. national average milk output was only 7,211 lbs. (3,353 qts.) per cow in 1961, less than half of the Thomas average!

How do they do it?

Almost any cow will give fair amounts of milk if fed right, housed

right, milked right. But the elite of the cows, those that produce enormous quantities of milk (20,000 lbs. of milk per year and more) are qualified by heredity for their task.

The Thomas Ranch has been breeding over a period of years for high milk yield. When it had the right kind of cows, it created the kind of environment the animals like best. The words "contented cow" are not just an empty phrase.

The latest contribution to "cow-comfort" is metal-roofed sheds (cows don't like to be exposed to the hot sun), with individual loafing stalls (cows like their privacy) equipped with rubber-mats (cows like to lie on soft beds).

The sheds—or bedrooms—are not the only space where the cows may roam at will; there is also the diningroom. Here are feed troughs into



A section of a circular calf-feeder which is composed of calf huts assembled around a rail. A milk tank, driven by motor, travels on the rail dispensing milk through a nipple.

As the device travels on the rail, calves await next crack at the feeder. Each calf gets four minutes at the nipple, and four minutes to help itself from a feed box.



which huge wagons with automatic unloading devices dump quantities of succulent roughage, freshly chopped in nearby fields throughout most the day; here, too, hay is offered in easily accessible racks and there is plenty of good water (a high producing cow will drink between 25 and 50 gallons per day).

### A sense of time

Only twice a day are the animals disturbed in their pleasant duty of eating and resting. That's when they are brought to the parlors for milking. The well-fed, well-treated, rested cow is eager to milk. Those that have calved recently (the peak of milk production is about three months after the birth of a calf) will lead the rest to the ramp marking the entrance to the milk parlor. Cows have a highly developed sense of time and, as a rule, will be waiting every day at exactly the same hour, at exactly the same spot, ready to be milked. For the notorious stragglers, electrically operated gates running on wheeled tracks are provided. A push of the button, and the gate starts moving slowly, gently nudging the slow-pokes.

Milking at the Thomas Ranch proceeds almost around the clock, in three shifts.

The milking crews' hours are such that the same man always milks the same cows. This is one of the secrets of the success of this "dairy factory."

It also makes work easier. Close to 10,000 lbs. daily is the quantity

of milk a good milker can get out of the cows for which he is responsible. One who milks 195 cows twice a day every day, except on his day off, got credit for an output of  $3\frac{1}{2}$  million lbs. of milk last year. Milkers operate on an output bonus system.

Of course, all the milker does is operate the milking machines. At the Thomas Ranch, everything else is automatic, including ingenious electronic devices that provide powerful psychological motivation. The devices are set to release a measured quantity of grain corresponding to the quantity of milk given by the animal in such fashion that the cow expects a reward for letting her milk down. This makes the animal "let-down" conscious, allowing the operator to do his job in less time, putting more milk in the owner's bulk tank (and more money in his pocket.)

Maybe the only phase of operation at the Thomas Ranch that is not completely mechanized is the calf care. Baby calves are kept in individual pens fed milk from nipple-equipped bottles, brought twice a day in a truck.

But farther north, on the Wes Sawyer's Diamond S Ranch in Waterford, a most ingenious system of calf-feeding is used.

Old-timers among dairy farmers claim (and rightly so), that no calf will thrive like those that are allowed to suckle their dams whenever the fancy takes them. This may be as many as 6 or 8 times a day.

This principle has been incorporated in an "automatic calf-feeder."



Anywhere between 30 to 60 calf-huts are assembled around a rail, laid out in a circle. The feeder itself consists of a 70 gal. insulated milk tank, propelled by an electric motor that travels on the rail, dispensing into a quart container measured amounts of milk, brought to the right temperature over a flash immersion heater. A rubber nipple protected by a shield gives the calves access to the milk.

As the device travels on the rail, calves wait impatiently for the next roundtrip of the nipple. Each calf gets four minutes to empty the jar and another four minutes to help itself to some hay and grain from a feed box which follows the milk dispenser. This opportunity repeats itself six times a day. All the operator has to do is to fill the tank early in the morning, set the timing and send the contraption on its way.

In modern dairy "factories," even manure disposal is automated.

Sanitary requirements in most states require removal of the day's manure from the premises. To remove a day's manure of 2,000 cows is a real task. But the solution has been found at the Thomas Ranch.

High pressure jets of water wash the manure from the milking parlors, the alleys and the cow-sheds into an underground drainage system, whence it flows as a slurry into a sedimentation pit. Here the solid matter settles to the ground. Bucket conveyors load it into trucks. The liquid manure (rich in nitrogen) is diverted into the irrigation system, benefiting all nearby fields, which

are heavily dependent on irrigation.

What's next?

Milking machines that will turn themselves on and off automatically are already here. And experiments are being made to produce synthetic feed that will provide all the nutrients a cow needs in one ration, without hauling hundreds of tons of "roughage" every day.

In the field of artificial insemination, in the future only 150 bulls may be required to breed the entire cow herd of the U.S. every year. (There are 17 million milking cows in the U.S., but the number is going down.)

Electroforesis may allow the dairy farmer not only to determine but to select the sex of the calf. Embryonic transplants may enable the genetically most valuable cows to go through not one, but three or four pregnancies in nine months, the normal period for the gestation of one calf. The fertilized ova are removed and implanted into the uteri of less valuable females.

Finally, there is the possibility that cows may milk without having to go through pregnancy and birth of a calf. Artificially induced lactations, by injections of sundry pituitary hormones have been successful (though rather expensive and not very practical). Soviet and Rumanian researchers are known to have kept virgin heifers in milk for as long as 234 days.

The word "bucolic," from the Greek word for cowherd, means pastoral, rustic, says Webster. Not any more, Noah, not any more.

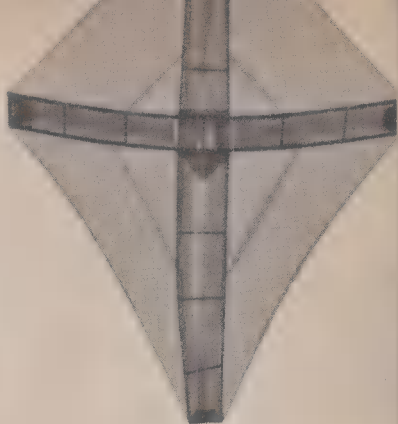
# AIR

## your knowledge

by John and Molly Daugherty

Good old air—we can't see it, we can't smell it, and we can't taste it. But we can't live without it either, and we should know something about it. How much do you know?

1. All the air in the world weighs nearly twelve million million million pounds. How far up would you have to fly to have half of it under you?
  - a. 20 miles
  - b.  $8\frac{1}{2}$  miles
  - c.  $3\frac{1}{2}$  miles
2. The air pressure on one square foot of your body is:
  - a. 2,000 lbs.
  - b. 20 lbs.
  - c. 2 lbs.
3. The ultra-violet light in sunlight would kill you if there were not a layer of what gas in the air?
  - a. Ozone
  - b. Carbon dioxide
  - c. Nitrogen



PIX photo by Lou Jacobs

4. There is so little air 250 miles above you that the space is almost a vacuum, in terms of air pressure. Even so, air molecules exist. Approximately, how far apart are they?
  - a. 2 miles
  - b. 40 miles
  - c. 100 miles

5. How high does the temperature of air molecules rise 250 miles up?  
a. 24,000° F  
b. 450° F  
c. 1500° F
6. The earth's atmosphere once contained lots of hydrogen. It doesn't now. Where did it go?  
a. It united with oxygen to form sea water.  
b. It burned up as fuel during the formation of this planet.  
c. It escaped into space.
7. You hear that plants give off oxygen and animals give off carbon dioxide. When you exhale, what percent of carbon dioxide is in your breath?  
a. 100%  
b. 21%  
c. 4%
8. If the molecules of air in your tires stopped moving, your tires would:  
a. Go flat  
b. Blow out  
c. Stay solid
9. What chemical purifies water, yet leaves no trace of itself?  
a. Chlorine  
b. Ozone  
c. Charcoal
10. Liquid oxygen is:  
a. As colorless as water  
b. Blue  
c. Pale brown
- 3 - a The ozone layer, 25-30 miles up, absorbs the dangerous ultra violet rays. It allows the less harmful rays to get through. Sun shining through oxygen ( $O_2$ ) changes it to ozone ( $O_3$ ).
- 4 - b In contrast, air molecules are only millionths of an inch apart in your living-room.
- 5 - a As you go up in the atmosphere, the temperature falls at a rather uniform rate until it reaches -67° F in the stratosphere. For many miles through the stratosphere, it remains constant. Above 20 miles, it starts to rise until it reaches an estimated 24,000° F 250 miles up. An astronaut would rarely meet even one of these hot molecules. It would take millions to do any harm.
- 6 - c Hydrogen, the lightest and smallest molecule, travels faster than other gases in air. During the formation of the earth—hotter then than it is now—the velocity of hydrogen equalled or exceeded the escape velocity of about seven miles per second.
- 7 - c The air you inhale contains .03 percent carbon dioxide. The percentage increases to 4 percent when you exhale. At the same time, the oxygen content is reduced from 21 percent to 17 percent. Actually, there's more oxygen than carbon dioxide in the breath you exhale.
- 8 - a Molecules constantly move

**Answers:**

1 - c Air is so compressible, gravity holds half of it close to the earth.

2 - a You live under a canopy of air. The pressure due to the weight of the air above you is great. The reason your skull isn't crushed is that you have equal pressure on all parts of your body.

and strike the walls of the tires without loss of energy. This produces pressure. Molecules would stop moving at  $-459^{\circ}\text{F}$ .

**9 - b** Ozone is more active than oxygen and destroys germs. Ozone turns to oxygen and leaves no trace of itself.

**10 - b** Oxygen as a liquid is blue. As a gas, it's odorless, tasteless, and colorless.

### Score yourself:

**9 - 10 right:** You've certainly aired your knowledge on this quiz!

**4 - 8 right:** What you know about air is fair.

**0 - 3 right:** Let's leave your score up in the air!

### *Her Master's Voice*

"Now open, Sesame," Arnold Lesti of Kensington, Md., commanded. The door to the conference room swung aside. Lesti's faithful servant is four-year old Cynthia, tall (six feet) and husky (two feet wide). From head to toe, she is jammed with enough electronics to make her a whiz kid even in the brainy world of computers. She responds to voice commands, while most computers have to be fed punched cards or magnetic tape, and she can't be fooled. "Open now, Sesame," Lesti said. The door didn't budge. "She's learned her lesson well. She's been taught to open the door only when I give the correct command," Lesti explained.

Cynthia can also tell the difference between similar-sounding words like "east" and "yeast" or "sun" and "sung." She has a keen ear for voices. She will obey only her master and creator, Arnold Lesti, if he teaches her to, or she can be taught to obey anyone. This ability to learn is Cynthia's best talent. Like people, she learns from experience. Lesti gives her a command and punches a button to tell her what to do when she hears it. At first she makes mistakes, but she learns from them, and soon gets her lesson straight.

True to her full name, synthetic intelligence machine, "Cynthia has the ability to recognize and understand concepts, so when the machine sees something it never saw before or hears something it never heard before, it is able to tell into what concept or category the new instance fits and come up with the correct answer," Lesti says. Future Cynthias will be able to read typed, printed or written matter and understand the meaning of whole sentences, paragraphs, pages and books, either written or spoken. "Only slightly more sophistication is needed," says Lesti, "before we will have a machine that can carry on an intelligent conversation or solve the most complicated problem. The day is not too far off when we'll be able to mass produce scientists and engineers."



# New magic with your

**Dentistry today can save a tooth even if it is knocked out.**

**Here are 6 facts and 7 questions-and-answers you ought to know about saving teeth.**

**Y**OUR teeth can be saved:

*When the nerve of a tooth is injured either accidentally or by deep decay.* For a young person the dentist may decide to remove only the involved portion of the pulp, when possible, leaving the healthy portion of the pulp in the root canal. In an older person it is generally necessary to remove the entire pulp.

*When the nerve of a tooth becomes infected.* In such cases toothache often occurs. When the pulp is removed, the source of the infection is removed. The dentist will want to make a bacteriologic test to be sure that all the germs have been destroyed.

When the jawbone has become involved from long-standing pulp disease, the bone may or may not be painful and may or may not be infected, but it always requires treatment. If the amount of bone destroyed is small, simply eliminating the source of the trouble by treating and filling the root canal will result in repair of the damaged bone. Healing is no different here than in

any other part of the body. If much bone has been destroyed or the root tip has been damaged, it may be necessary to trim the tip of the root and remove the diseased tissue, after which the bone will grow back normally.

When a tooth is fractured and the nerve or pulp of the tooth is exposed or dies, the nerve should be removed, and the remainder of the tooth can be restored to normal function. In some cases where the fracture is large, the appearance of the crown may need to be restored by means of a porcelain jacket.

When a tooth is accidentally knocked out of the jaw it can be replaced. Children are generally the ones who meet with such accidents. A tooth that has been knocked out should be washed and kept in water. The child and the tooth should be taken to the dentist at once. The sooner the tooth is replaced in the jaw, the longer it is likely to remain in the mouth.

When a tooth becomes dark it can be bleached and restored to its original color in most cases. Bleaching is a relatively simple process which is done from the inside of the tooth.

# old teeth



These photographs show the upper right central tooth before and after bleaching.

In many cases the result is permanent, but in some cases the tooth gradually darkens again.

Some common questions:

*Question:* If the nerve is removed, won't the tooth be dead?

*Answer:* No, the tooth will not be dead because it has another source of blood, nutrient and nerve supply by way of the tissues which attach the tooth to its socket. Only one source of nerve and blood supply, the pulp, will be removed while the other will continue to function.

*Question:* Will the tooth turn black after root canal treatment?

*Answer:* A tooth never turns black, but it might become darker. Most teeth do not darken after treatment. If one should, its original color could be brought back by bleaching.

*Question:* How long will the tooth last after endodontic treatment?

*Answer:* This depends somewhat on whether the root canal alone is

involved or whether the bone is destroyed also. If only the root canal is involved, the chances for success of the treatment in removing the infection are good. If there is bone involvement, success of the treatment will depend somewhat on the health of the patient and the ability of the body to repair the damaged bone. Upwards of 90 percent of teeth treated endodontically last just as long as other teeth which do not require this treatment.

*Question:* Am I justified in spending the money for root canal treatment?

*Answer:* The alternative is extraction and replacement of the tooth. Authorities agree that artificial substitutes do not function quite so well as natural teeth. In addition, extraction and replacement usually cost as much as or more than endodontic treatment and a filling.

*Question:* Can infection of the root canals always be treated?

*Answer:* No. In cases where it is not possible to reach the germs in the root canal, because at times the root canal may be narrower than a pin, or where the root canal is blocked, treatment would not be successful. In cases where there is considerable infection with destruction of much bone or where a cyst is present, root filling alone will not suffice. In such cases, in addition to filling the canal, a slight operation on the tip of the root will save the tooth.

*Question:* Won't my health be jeopardized if I keep such a root canal-treated tooth?

*Answer:* No. The following precautions are taken by your dentist to

make sure that a tooth that has received root canal treatment remains free of infection.

1. The use of a bacteriologic test during treatment to determine whether infection has been eliminated.

2. Periodic recall to observe such a tooth by x-ray examination when there is any question regarding a successful result.

*Question:* May a root canal treated tooth be used as an anchor tooth for a bridge?

*Answer:* Yes. When normal healing has occurred, a tooth that has had endodontic treatment usually serves equally as well as any other tooth as a bridge support.



# Electronic jungle goes to sea



Master of the "General H. H. Arnold," Don J. Houle (upper left), and Chief Mate Raymond Soucy (upper right) prepare to take world's largest missile tracking ship to sea.

**B**RISTLING with electrical equipment, a veteran of two wars has put to sea again as an important addition to the space age.

The converted 14,300-ton troop transport, *General H. H. (Hap) Arnold* is now the most heavily instrumented tracking station on the United States' Atlantic Missile Range.

The multi-million dollar instrumentation, including the most advanced radar on the missile range, is designed: 1. to watch the fateful moments of a missile as it plunges through the earth's atmosphere into the sea; 2. to observe intricate char-

acteristics of the missile's flight, which may tell the difference between those that are carrying warheads and decoys.

This floating island with its three- and four-story high, saucer-shaped radar antennas will be used not only in missile tests but also as a monitor for man-in-space operations, lunar and deep-space probes.

Sperry Rand Corp., prime contractor for the ship's design, conversion and instrumentation, expects the *Gen. Arnold* to give U.S. missile testers over 100 million bits of detailed information about critical phases of a missile's flight.



# The 1964 car they

by Bruce H. Frisch

**Once again Detroit has ignored auto safety in its new models. Scientists and engineers have long known how to make a car safer. But manufacturers say you—the public—are not interested in safer cars. You may be when you know more about them. Here are the facts.**

**T**HE slogan under ads for the 1964 cars could be "Buy the car of the past." The '64s are at least 17 years behind the times—in safety.

The military had learned enough about crashes by the end of World War II to cut their airplane crash injuries by 80 percent. You still can't buy these life-saving design fundamentals in an automobile.

Crash research was fathered by Hugh De Haven. While with the Royal Air Force in World War I, De Haven was struck by the way some pilots escaped unscathed from apparently fatal crashes.

## What the body can stand

In 1940 he got a U.S. government grant to study the miraculous escapes of people who had fallen or jumped from heights of up to 150 feet. He found that the human body could stand much greater forces than had been thought if the forces were spread out. "Thus," De Haven says, "we were able to state as early as 1942, that by redesigning

structures to absorb energy and distribute force, it was possible to enhance survival and moderate injury, within wide limits, in aircraft and automobile accidents."

The government continued to back De Haven by sponsoring the Aviation Crash Injury Research Project at the Cornell University Medical College in 1942. From aviation research, there developed the idea that there are two accidents in every crash—the collision of the vehicle with the ground, and the collision of the operator with the vehicle.

Efforts were made to reduce the seriousness of the second accident by increasing the airplanes' "crash-worthiness."

To do this, four rules were borrowed from the passenger package designer: 1. The package should not crush the contents. 2. The package should not burst open and spill the contents. 3. The contents should be anchored inside the package. 4. In case the contents should break loose, the inside of the package should be shock absorbent.

# didn't build



Today's cars, like these on New York's West Side Highway, boast many new features. But in a nation on wheels, accidents occur, and few cars protect you when they do.

As a result of this approach, seats were made stronger so they wouldn't break loose. Seat belts were redesigned. Cockpits were made uncrushable and the insides padded. Sharp edges were eliminated. Control knobs were recessed.

## The pilot took the rap

While wrapping the pilot in a secure package, the services still kept hammering at him that accidents were "90 percent pilot error." But new lines of research suggested the pilot was often taking the rap for airplanes not designed for human frailty. So control knobs were put

in standard positions and given standard shapes. Distracting and fatiguing glare spots were painted matte black.

As the number of crash deaths dropped, the flying services soon found that more pilots were being killed in automobiles than in airplanes.

The government jumped into automobile research with much less success. Most of the fundamentals had already been learned from the aircraft research of the '40s, but the Government doesn't have power over auto design as it does over airplane design.

De Haven switched to the new

## The leading cause of car injuries is the steering wheel. It accounts for one-third of the million auto injuries each year.

field in 1953 by forming the Automobile Crash Research Project with financing by the Armed Forces Epidemiological Board, the National Institutes of Health and the Automobile Manufacturers Association. He used the road as a lab, gathering detailed accident reports from co-operating states, putting the information on punch cards and analyzing the crashes by computer.

One of the early ACIR studies revealed how stagnant automobile safety design was. A comparison of '40-'49 cars with '50-'54 cars showed each group was involved in similar accidents which caused similar injuries for similar structural and mechanical reasons. "Fifteen years of passenger automobile design have, at best, produced no advance in crash-worthiness," the report stated.

### The open door policy

One structural defect was the doors. The project's first study found doors popping open in 72 percent of fatal accidents, violating packaging rule 2. Deeper probing showed that it was much more dangerous to be thrown out of a car, than to remain inside. If doors stayed shut, it was estimated, 25 percent of rural auto accident fatal-

ities could be avoided and 10 percent of city auto deaths, for a total of 5,500 lives saved a year.

In 1956, cars began carrying improved door locks. By 1961, ACIR found that cars with the new locks had one-third fewer door openings.

The leading cause of injuries turned out to be the steering wheel, accounting for about 29 percent of the more than one million auto accident injuries each year.

By crashing real cars, researchers at the Institute of Transportation and Traffic Engineering of the University of California found out what made the steering wheel so dangerous. Cars heavily laden with instruments were towed into barriers or into each other in front of high-speed movie cameras. The University of Minnesota and later Ford used the same technique. In head-on crashes—59 percent of injury-producing accidents—the steering wheel was pushed back and up, at the same time that the dummy pitched forward. The result was that a driver would be speared on the steering column.

Aircraft steering wheels have long been molded in a shape to cradle the chest. Starting in 1956, most cars have had dished wheels, the rim of which is meant to collapse easily to cushion the impact. In the U. of C.

crashes, recessed steering wheels appeared to do little to reduce chest-indenting forces, and shallowly dished wheels still collapsed down to the hub.

Engineers of the Liberty Mutual Insurance Company have designed a steering column they think is better. It has a telescoping section and a flexible shaft. It is one of the safety features on the company's Survival Car II, a converted 1960 stock sedan. Among 20 other improvements built into the car are extra-strong front seats with high backs to shield the head in a roll-over and to prevent whip-lash injury to the neck in rear-end collisions; an auto-

matic fire-extinguishing system; an alarm to awaken sleepy drivers, or if that fails, stop the car; and lap belts and shoulder harnesses all around.

Just as important as the devices themselves is the way they are laid out. A good arrangement, designed to fit the driver, will reduce fatigue, give full vision and place all the controls easily at hand.

The Harvard School of Public Health found that the workspace in vehicles did not fit the driver. "We were assured [by the industry] that there were manikins and Oscars and design standards," says Dr. Richard G. Domey. But every standard was



Liberty Mutual engineers took a 1960 sedan and added more than 20 improvements, including telescoping steering wheel, high-backed front seats, a driver alarm, harnesses.



## Ford took a stab at selling safety in 1956 and had a bad year. The public's head-in-the-sand attitude, and the manufacturers,' continues.

different. Each company was designing for a different size American, none the real one. The school detailed a physiological anthropologist to survey the scientific literature back to 1895 to come up with a more realistic standard. The data was completed in 1961 and offered free. "We have been beating on your door [Detroit], pleading for you to at least look at the data and consider them," says Domey. The industry isn't interested.

Everyone is interested, however, in which is safer, the big car or the small car. So far nothing has been proved scientifically one way or the other. ACIR made a preliminary study, but they collected too few reports of small car accidents to give statistically significant results. They are now doing a full-scale survey.

Some safety ideas go back more than 17 years. Seat belts, for instance, were first used in an airplane in 1910. In 1940, Victor W. Killick, Chief of the Bureau of Statistics in the California Department of Motor Vehicles, watched the accident reports coming in and suggested a telescoping steering column because, "Too many drivers in present-day accidents are literally stabbed to death by the jagged parts of steering columns. . . ." Rust Heinz of the "57 varieties" family anticipated

passenger-packaging by almost 30 years by designing a car in the mid 1930's which had foam rubber padding inside and no protrusions from the walls.

Why can't Detroit make a safer car than a pickle manufacturer can? It isn't a matter of can do but of want to. When not simply ignoring advocates of safe design, Detroit pleads, "The public isn't interested."

Trailing the public is a Detroit tradition. Back in the late 1930's, William B. Stout, then ex-president of the Society of Automotive Engineers recalled: "The first cars built were copies from buggies with open top, dashboard and whip socket. The whip socket was left on the dashboard, because it had been there in the buggy, and they were afraid the public would not buy a dashboard that did not have a whip socket on it. Much of the engineering on motor cars during the past few years has been of the 'whip socket' variety, and all the engineering that you will get from the public survey is 'whip socket' engineering—the demand for something that has been seen before."

All the auto companies have safety engineers who take a back seat to stylists. Roy Haeusler who runs the safety program for Chrysler has admitted, "... Safety consider-

ations are far from the only ones which determine [design] . . . there are other factors governing the decisions and the other factors might not, in my estimation, at least, be half so important as safety considerations."

Another point made by industry is that the added cost of safety features would hurt it in a competitive market. John E. Ullman, a specialist in the economics of innovation at Hofstra College, points out that all industry puts savings to itself ahead of savings to the user. He cites as an example the aluminum engine. It was more expensive to make than the traditional cast iron engine, but weighed less. The resulting improvement is gasoline mileage would have given the user a net saving. Yet, until new casting techniques lowered the manufacturing cost, the industry stuck with cast iron.

### Safety for \$10

For similar reasons auto companies resist safety innovations that would raise costs, although Liberty Mutual estimates that its 22 safety features would add only \$10 to the cost of an automobile.

Ford took a stab at selling safety in 1956. Fletcher N. Platt, Manager of the Traffic Safety and Highway Improvement Department at Ford said, "We are giving increased attention to the safety factor in the automobiles we build, and in the last several years have gone into an area long considered 'taboo' by our

industry and have opened up the whole question for public discussion."

The Ford package had four main parts: 1. Seat belts, found by ACIR to reduce the risk of serious injury or death by 35 percent. 2. Better door locks. 3. Dished steering wheel. 4. Padded dashboard.

ACIR has compared identical-make cars with and without instrument panel padding. They found the padding helped to prevent minor injuries in mild accidents, but had little effect on severe to fatal injuries. In general, this package, available on most cars, is only a start.

In any case, Ford had a bad year in 1956 and gave up advertising safety in the middle of the year.

People may be convinced by a manufacturer who talks about accidents, but they are likely to be annoyed at one who raises their anxieties, says Lee Rainwater. He has studied corporate images for Social Research, Inc. Seat belts may be a reminder of accidents, he says; he feels that auto companies may have sensed these things when they refused to stress safety in advertising. On the other hand, "Most consumers probably respond quite favorably to reassurance on this score. . . . The public believes that it is paying the company and its engineers to provide the best possible products."

The public head-in-the-sand attitude was revealed by 1960 ACIR study of seat belts in California. Only 3.5 percent of cars involved in accidents had seat belts, and they

were used only one-third of the time.

Except for seat belts, passenger packaging has the advantage that the driver doesn't have to cooperate for it to be effective. This is what physicians call passive protection, when they compare traffic deaths to an epidemic. Public health officers have found passive protection (water purification) more effective than active protection (each person boils his own water).

Moral suasion has had little effect. President Roosevelt established the first of a long line of ineffectual presidential committees on traffic safety by convening the Accident Prevention Conference in 1936. The Conference tried a gentle nudge, saying, "We strongly urge the industry to take united action to eliminate [accident hazards]. . . .

"We believe such voluntary industry action will be more effective than compulsory action from other sources, which a growingly impatient public would demand."

Twenty-six years later, Presidents were still trying. President Kennedy said in his 1962 State of the Union message, ". . . I am requesting the Department of Commerce and Health, Education and Welfare to review with representatives of the automobile industry, those changes in automobile design and equipment which will help reduce the unconscionable toll of human life on the highways and the pollution of the air we breathe."

The industry resents being told what to do, and the public has been

slow to anger, but recently, pressure has been growing.

Bills have been introduced in Congress to have the Federal Government devise safety standards for automobiles. Although the bills were defeated, Governor Paul Fannin of Arizona warned his fellow governors that the Federal Government would probably move into traffic safety. This action, he said, would be "justified by the lack of action in the past of the states in connection with a better traffic safety record."

### Intrastate chaos

Federal action may be better anyway, according to Dr. Daniel P. Moynihan, ex-chairman of the New York State Traffic Safety Policy Committee. It would avoid the "chaos" of state-by-state legislation on safety devices, he says.

In the view of New York State Senator Edward J. Speno, head of the Joint Legislative Committee on Motor Vehicles and Traffic Safety, Federal action should be linked to a new design approach. He wants the Public Health Service to finance a prototype car to be built by the aircraft industry and designed for safety from the ground up. Survival cars are fine, he says, but they involve only tacking safety devices on conventional cars.

"Whip-socket" Stout had a name for "the invention of gadgets to cover up defects"—"inventing rubber gloves for leaky fountain pens."

The trouble is even rubber gloves are missing from the '64s.



# the progress of MEDICINE

by Arthur J. Snider

## How to fall off a building

**I**F YOU find yourself accidentally falling off the roof of a building, relax and try to enjoy it. If you do, your chances of escaping injury are much better.

The research arm of the Federal Aviation Agency has collected 12,000 cases of "free falls"—about 96 percent of all those reported in a two-year period—and has found that a surprising number not only survive but walk away uninjured.

This is especially true of those who have been drinking and those who attempt to commit suicide by jumping.

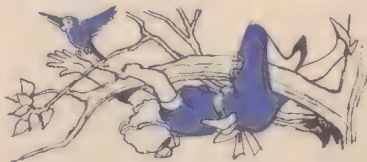
Muscles of the tipsies are understandably slack. But what accounts for the looseness of those seeking self-destruction?

Dr. Richard G. Snyder of the Civil Aeromedical Research Institute, Oklahoma City, points out that most of the suicide-bent are mentally ill.

"The psychotic patient differs primarily in one important respect in regard to falling," Snyder explains.

"He wants to jump. The act of jumping may be a release for him, and unlike most of us, this individual may enjoy the jump. As a result, he may be physically relaxed at the time of impact."

Why some people can survive the effect of impact forces and others can't is a key question being explored. The purpose is to obtain information that would be useful in designing aircraft for greater protection of passengers in the event of an impact.



Snyder reports in "Aerospace Medicine" on a group of 137 persons who survived falls up to 275 feet and velocities up to 79 miles an hour. The age range was 18 months to 91 years.



The 91-year-old man fell from a drawbridge while it was being raised. A 75-year-old man fell into a bomb shelter he was constructing. A 69-year-old woman fell out of a tree while going after her parakeet.

"We have examples of about every conceivable way of falling," says Snyder, "including the eloper who fell off the ladder and had to postpone the wedding."

There have been numerous cases of people diving into empty swimming pools and several involving falls out of roller-coasters.

Some 87 people have "jumped or fallen" from the Golden Gate Bridge.

With the increasing popularity of parachuting, the toll here is rising. Eighteen such accidents were tabulated over a six-months period. There have been about 50 falls from aircraft in a single year. These include stewardesses and pilots of light planes involved in an emergency.

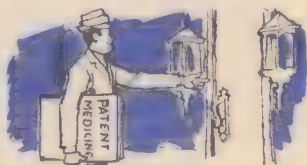
For reasons not yet fully understood, many free-fallers land feet first. Head position is next and rump position, third. Workmen who fall from steel girders frequently drop head first, particularly if they have suffered an electric shock. One case was recorded in which the impact on the concrete may have saved the shocked workman's life by re-initiating respiration.

### Don't buy these 'remedies'

Jerry J. Walsh is an arthritis victim who journeyed 43,000 miles to alert his fellow sufferers to the dan-

gers of misrepresented remedies, devices and nostrums on which Americans spend as much as \$250 million a year.

His report, issued by the Arthritis and Rheumatism Foundation, shows the "best sellers" depend on geographical location. On the East Coast, the arthritis quacks sell the "hot, dry climate." In the Midwest, it's sea water; in the South, it's uranium mines; in the mountain states, it's food supplements; and on the West Coast, "machines."



Patients fall for arthritis quackery because of the constant pain they have, because of the fear of their condition getting worse and because of lack of information from proper health sources.

Most promoters reach their patient through "doorbell doctors," the door-to-door salesmen who can expect to find an arthritis sufferer in almost one family in every five. Older people seem to go for the patent medicines and the "natural" food pitch. Younger sufferers take the shot or the pill because they say they can't take the time for a "slow" medical treatment.

Dr. Ronald W. Lamont-Havers, medical director of the foundation, says there are 12 million Americans with arthritis.

## Sniff before you eat

A person's sense of smell is his best protection against botulism, a food poisoning that has caused several deaths in outbreaks this year in the United States.

Food contaminated by botulina poison has a "horrible" smell and taste, says a University of Michigan public health scientist. It is surprising to him that anyone can eat such food.

People can be immunized against botulism with an injection of the proper toxoid. It is customary for researchers to take such shots when they are going to work with the organism, *clostridium botulinum*. But because the disease is so rare, immunization has never been recommended for the general population.

The toxin responsible for botulism is the deadliest poison known to man. Arsenic, curare or cobra venom are mild by comparison. Experiments on mice show that one hundred billionth of a gram of pure botulism toxin is lethal.



The rare victim of the poison usually gets it by eating meat, fish or non-acid vegetables that are improperly canned. The trouble starts when the toxin is absorbed from the intestines into the blood stream. It

blocks transmission of impulse between the nerves and the muscles, causing paralysis of the muscles, particularly the breathing and heart muscles.

## Why some 'catch' leukemia

If leukemia is caused by a virus, as many scientists believe, why don't others who are in close association with a patient develop it.

The answer may be at hand. Investigators who have studied brothers, sisters and parents of eight leukemia victims have found many of them do indeed become infected. But instead of coming down with leukemia, these family members develop antibodies that protect them from the disease. In effect they become vaccinated.

The patients themselves, unable to develop sufficient protective antibodies, inevitably succumb to the disease.

This theory is offered in the *Journal of the American Medical Association* by Dr. Steven O. Schwartz and Dr. Irving Greenspan of the Hektoen Institute for Medical Research, Chicago.

They investigated an unusual grouping of eight fatal leukemia cases that occurred between the fall of 1957 and the summer of 1960 in Niles, Ill. (See *Science Digest*, June, 1963). Seven of the eight children attended the same parochial school. The eighth had come frequently to the school playground.

Drs. Schwartz and Greenspan took blood from each of the family

members and demonstrated the presence of specific viral antibodies in many of them, indicating an aborted infection.

Why are leukemia patients themselves unable to develop protective antibodies when infected with the virus? It may be that their protective machinery has been overwhelmed, Dr. Schwartz says, or in some way it does not have the capacity to respond to the attack of the virus.

The reason for differing reactions among members of the same family, Dr. Schwartz says, is that each member has a different genetic background and immunological equipment. It should not be surprising that they vary in their susceptibility to leukemia, just as they would to other infectious diseases.

Dr. Schwartz acknowledges that the viral theory must still be proven, but the Niles family findings lend further support to a chain of evidence that includes the following discoveries:

1. Leukemia viruses have been identified in mice. The viruses can be injected into other mice and cause the disease.

2. Viruses similar to those seen in mouse leukemia have been recovered from human patients. While it cannot be said they are "leukemia viruses," they are rarely seen in non-leukemia patients.

3. It is possible to take an extract of brain tissue from human leukemia victims, inject it into certain inbred strains of mice, and produce leukemia.

## Let the kid get up

A British physician opposes strict bed rest for sick children. He says it is boring, makes sleep at night more difficult, and isolates the child. In fact, says Dr. R. S. Illingworth of the University of Sheffield, England, some children exert less energy when up than when in bed.



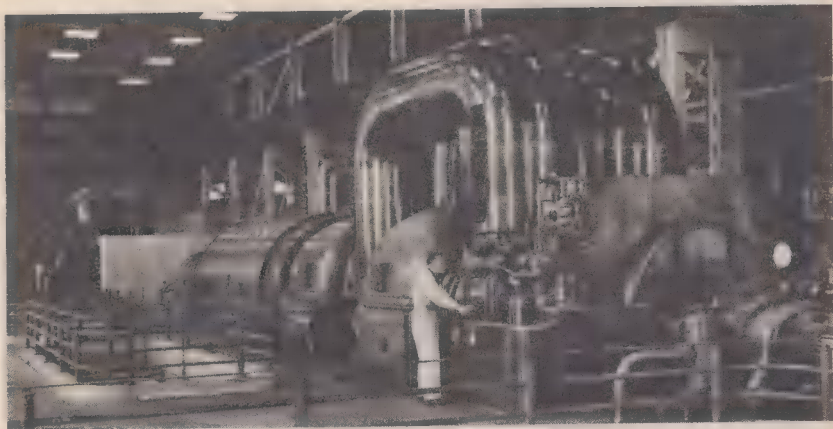
In making a case against bed rest, Dr. Illingworth says it predisposes to obesity, increases loss of minerals and increases the risk of kidney stones forming.

It does not appear to shorten the duration of illness in children with respiratory infections, he contends. Nor does it inhibit the spread of infection to brothers and sisters.

There are some diseases, however, in which rest in bed is strongly indicated. Exercise increases the risk of paralysis in certain stages of poliomyelitis. In patients with liver diseases, relapses can be severe in children allowed out of bed.

Children with pneumonia usually may be allowed to be out of bed after one or two days, Dr. Illingworth says. Children with measles may be allowed out of bed as soon as they feel well enough. Rheumatic fever patients may be allowed up as soon as comfortable.

# YOUR SCIENCE ABC's



Inside an electric power plant. In the foreground is a steam turbine; behind it, the generator it drives. Today's generators may produce thousands of volts and require engines with hundreds of horsepower to turn them.

## Generator

### THE MACHINE THAT MAKES YOUR LIGHTS GO ON

**A**N electric generator or "dynamo" is a machine which produces electricity by what is called electromagnetic induction, and it is the descendant of the first experimental generator made by Michael Faraday, the discoverer of electromagnetism.

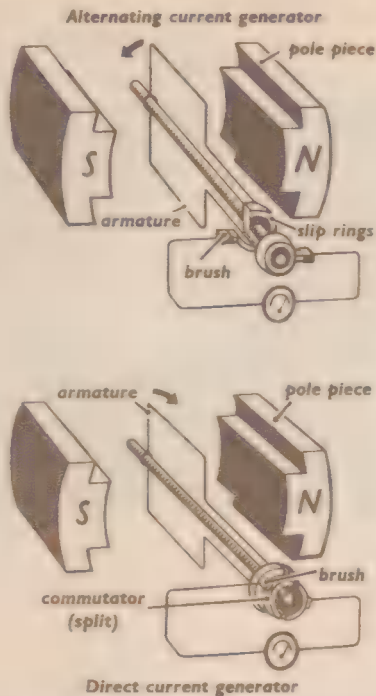
Electromagnetic induction is the name given to the way in which electricity is obtained by passing a

metal conductor through a magnetic field. Suppose a coil of wire has its ends connected to a laboratory galvanometer (an instrument for detecting electric current). If the coil is moved quickly backwards and forwards over one of the poles of a magnet, then the needles of the galvanometer will kick one way with the forward movement, and in the opposite direction with the backward movement. This shows that the backward and forward movements create electric currents in opposite directions in the coil of

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Alternating current changes direction. Direct current does not. A commutator changes the current from AC to DC.

wire, and this happens because the moving coil of wire cuts through the magnetic field. Many of us have seen pictures of the magnetic fields of bar and horseshoe magnets, and we know that these fields are made up of magnetic lines of force. A generator is a device for making a coil of as many turns of wire as possible cut through as many magnetic lines of force as possible, and to do so as rapidly as possible. The wire is wound round a drum called the "armature," and this is spun around between the poles of a magnet by means of a steam or diesel

engine. Sometimes a water turbine, driven by a waterfall, is used.

Modern electrical science owes much to Faraday's discovery, but his original generator was a very simple affair. A copper disc, called a conduction disc, had its spindle mounted so that it could turn between the poles of a magnet. The spindle was turned by hand, and an electric current was created or "induced" in the disc because it cut the lines of force of the magnet. This electric current was collected from the disc by a piece of metal touching its edge, and by a wire attached to the spindle. Faraday's generator created only a small electric current, and its voltage was not high. Modern generators may produce several thousand volts and require engines of hundreds of horsepower to turn them.

### Self-exciting generators

The most powerful generators are "self-exciting." This means that the "field" magnet between whose poles the armature revolves is really an electromagnet, and part of the current produced is used to magnetize it. In some designs the armature is the electromagnet, and the coils in which the current is generated are outside it and stationary. This type of generator is called a "stator." The type in which the current is produced in the rotating armature is called a "rotor."

If we think again about Faraday's simple machine, we will realize that the disc cuts the lines of

force of the magnet in opposite directions at each half turn, and so the electric current changes direction at every half revolution. The same thing occurs in big modern generators, for the turning coil or armature cuts the lines of magnetic force of the stationary magnet in opposite directions during each half turn. An electric current which quickly changes its direction like this is called an alternating current (AC for short). The alternating current from a generator is collected from the armature by short springs or "brushes" pressing against metal rings on the spindle. These "slip rings," as they are called, are generally made of copper and may

measure as much as a foot across.

Generators are often required to charge very large storage batteries, and a steady, or direct current (DC) is needed for this. A direct current is one which does not keep changing its direction. A direct current is taken from a generator by means of a commutator (or "changer") instead of slip-rings. A simple commutator is like a single slip ring which has been cut in half, so as to make two semicircles. As the commutator turns round, the brushes take the current first from one semicircle and then from the other, so that though the current alternates until it gets to the commutator, it is direct when it leaves the brushes.



*"And never the twain shall meet?"*

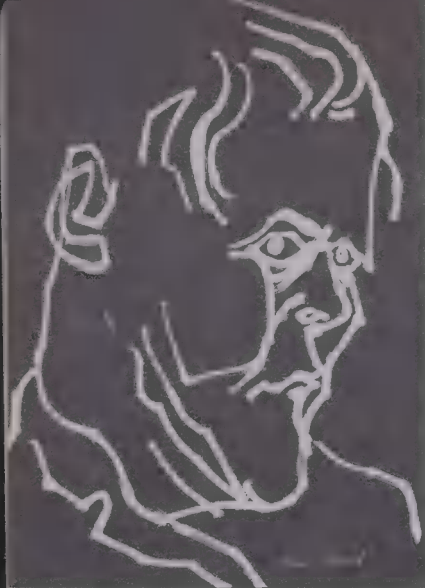
**W**ILL a third culture arise to heal the gap between two great intellectual factions of our time—the scientists and the men of letters? Britain's C. P. Snow, who is both an author and a scientist, believes it will.

Sir Charles sparked a major controversy when he first warned of the dangers of misunderstanding between the great minds of our times in a lecture at Cambridge University four years ago. He charged that the scientific and literary communities were drawing apart. Their intensely—and narrowly—educated members could no longer communicate, he said. This, he added, was "leading us to interpret the past wrongly, to misjudge the present and to deny our hopes of the future."

"It is dangerous," Sir Charles reiterates today, "to have two cultures which cannot or do not communicate. In a time when science is determining much of our destiny, that is, whether we live or die, it is dangerous in the most practical terms."

In speaking today of a third culture that may provide an answer, he says such a group "seems to come from intellectual persons in a variety of fields—social history, sociology, medicine and social arts such as architecture." They have an "inner consistency," he says. "All of them are concerned with how human beings are living or have lived . . ." in terms of fact.

Sir Charles feels the division between cultures is not as deep here as in Britain. "At Yale and Princeton and Michigan and California, scientists are talking to nonspecialized classes: at M.I.T. and Cal. Tech, students of the sciences are receiving a serious humane education."



# YOUR GUIDE TO MIND DRUGS



by Robert Mines

Director of Mental Health, Vermont Department of Health

Has science created a new power as fearsome as nuclear energy—drugs that can control the mind? Here are the facts about  
**HALLUCINOGENS**—Mescaline, Psilocybin, LSD  
**TRANQUILIZERS**—Chlorpromazine, Reserpine  
**BARBITURATES**—Phenobarbital  
**PSYCHIC ENERGIZERS**—Amphetamines  
**TRUTH SERUMS**—Sodium Amatyl and Pentathol



RECENTLY a lot of people have been both intrigued and frightened by stories of drugs that can control the mind.

What are they? What can they do? What can't they do? How helpful or harmful are they?

Let's take a look at these drugs.

Undoubtedly the ones with the most fabulous reputations are the *HALLUCINOGENS*—so-called because of the visual and perceptual distortions which they bring on. Psychiatrist Donald Hammersley has provided an excellent description of the effects of such a drug, in this case, Mescaline.

"I felt I had no responsibilities," he says, "no desire to make a decision. Someone asked me if I wanted lunch. I told him I didn't have to decide about that sort of thing anymore. Everything seemed pretty, in magnificent colors with extremely high intensities. A waterfall came cascading down the window shade, and I just sat there watching. For hours I giggled. The next day I felt terribly depressed."

*Mescaline* is the oldest of these drugs. It is made from the tops (or "buttons") of peyote—a variety of cactus found in the Southwest and Mexico. Scientists describe the effects of Mescaline as giving a person wide-screen, three-dimensional, Technicolor vision—the kind of sensation when a person feels his whole perception is intensely deepened and made more profound—accompanied by a distortion of both time and space.

Similar effects are also experienced when a person takes *Psilocybin*—which is obtained from a Mexican mushroom. It is even more potent than Mescaline. *Psilocybin* and Mescaline also produce unfortunate side-effects, nausea, dizziness, headaches, chills and extreme restlessness.

The newest—and most famous—of the hallucinogens is by far the most potent of all. It also has very few of the unfortunate side-effects of the others. This is *lysergic acid diethylamide*, commonly called *LSD*. It was in 1943 that it was first synthesized, by a Swiss scientist, Dr. Albert Hoffman. He obtained it from an erget compound named lysergic acid—and this, in turn, comes from a fungus, *claviceps*, found in wheat and rye grain.

The most incredible feature of *LSD* is the way such an unbelievably small dosage—one microgram (a millionth of a gram)—can drastically alter a person's mental state, for periods of from 12 to 18 hours. This was first noticed by Hoffman himself who recorded, after accidentally taking the drug, that for several hours he "experienced a peculiar restlessness and dizziness" and "a not unpleasant state of drunkenness characterized by an extremely stimulating fantasy."

Harry Asher, a British physiologist, was one of the early subjects of an *LSD* experiment. He described his experiences after taking the drug in *Experiments in Seeing*.

"On coming out into the corridor, I met the Deputy Vice Chancellor



"I wanted to bite the Deputy Vice Chancellor . . .  
The wish came in the form of a visual image.  
There were my false teeth snapping away in the air..."

of the University. I was fully conscious of his status, and a good thing too, for otherwise I would surely have bitten him in the waistcoat. Of all places to bite a man, the waistcoat is the least profitable, but it was only there that I wanted to bite him. The wish came in the form of a visual image. There were my false teeth snapping away in the air . . . and there was my head placed sideways and moving in to get a good bite."

Almost from the time it was first introduced into the U.S.A., LSD has been the subject of controversy. Some psychiatrists—notably in Canada, where LSD has been widely used in the treatment of alcoholism—contend that this drug is a very useful adjunct to psychotherapy. "While going through these experiences," one physician told me, "both men and women often become more willing to face themselves, they are less likely to become unduly upset by their shortcomings, and they are more open to suggestions for change than is normally the case."

But all psychiatrists agree that the drug is undependable. Some times it will have no effect at all. A person may vary widely in his

successive responses to LSD. Moreover, most medical researchers are convinced that with emotionally unstable persons, the effects of LSD may be disastrous.

According to Dr. Louis J. West, professor of psychiatry at the University of Oklahoma School of Medicine, LSD has not, in fact, proven to be a useful therapeutic tool for any emotional disorder. Dr. Roy R. Grinker, director of the Institute for Psychiatric Research at the Micheal Reese Hospital, Chicago, sees three major drawbacks.

(1) Persons with latent mental illness have been found to grossly disintegrate under even single doses. (2) Successive doses have been found to have almost equally serious effects, even with relatively normal persons. (3) Psychological addiction is also becoming apparent with many long-term users.

The upshot is this: far from allowing a physician (or anyone else) to control a patient's thoughts, this drug and Mescaline and Psilocybin, don't act in any predictable way at all. Something will probably happen, but no one can be sure what it will be.

There are other drugs—not classi-

fied as hallucinogens—which have demonstrated great capacity for affecting people's moods. It should be noted, however, that they don't control people's thoughts—they affect only their general outlook on life.

Best known are the *TRANQUILIZERS*. The first of these drugs, *Chlorpromazine* (Largactil) and *Reserpine* (Serpasil), hit the drug market in this country about ten years ago.

Today there are about forty-five additional types in use. One out of every six Americans has used them, and last year we spent about \$2 million on them. They have done an enormous amount of good—particularly in preventing certain types of people from becoming mentally ill, in speeding recoveries from psychoses and in helping former mental patients to stay well.

But even in “improving” our mental outlook, these drugs have strict limitations—limitations not nearly so widely publicized as their amazing powers. With seriously mentally ill persons they must often be taken in much the same way that a diabetic takes insulin—there can never be any let-up. Should a person discontinue taking the drug, a relapse is likely. This is less likely to happen with the person whose mental disturbance has been brief, but even he must often take the drugs for years.

Several of these drugs also have unfortunate physical side-effects. A number have been withdrawn from use for this reason. They brought

on such disorders as epilepsy, hepatitis, and dangerous blood disorders.

The biggest drawback is that even with the best tranquilizers, it is frequently impossible for any physician to predict what physical side-effects they might produce in an individual. “As a result,” says Dr. Morris Fishbein, former secretary of the American Medical Association, “physicians can't predict the total effect of any of these drugs at any time. Unfortunately, prolonged doses may drastically increase chances of unpredictable physical disorder. This makes it more difficult for any medical practitioner to help create a lasting better mental outlook with any particular drug.”

The *BARBITURATES*, which have a prompter soothing effect than tranquilizers, are in the long run far less potent and more dangerous.

The well known barbiturate *phenobarbital* pre-dates tranquilizers but was rarely prescribed for more than a few weeks because persons could become addicted to it. Moreover, any individual quickly develops a tolerance for small dosages and is tempted to try larger and larger doses. While taking large doses of the drug, a person may appear intoxicated.

Drugs intended to relieve depression, the *PSYCHIC ENERGIZERS* or “pep pills,” have more complex effects. The most widely used of these drugs are the *Amphetamines*

(Dexedrine). In controlled doses, such drugs have immense value in curbing depression and giving a feeling of increased energy. Dexedrine is often used to help dieters, because it curbs the appetite. But we quickly build up tolerance for these drugs too. Their doses must be continuously increased if they are to be used over any long period. When the doses become very large, these drugs can bring on an almost incredible and alarming range of emotional disorders—hallucinations, delusions, hysteria, amnesia, and so on. Worse yet, it is difficult for physicians to tell at what point these symptoms might occur.

Still another category of drugs frequently said to control our minds

are the so-called *TRUTH SERUMS*—under which we are supposed to be unable to hold back information. But research with two drugs of this type (*Sodium Amatyl* and *Sodium Pentathol*) has shown that claims for them are vastly exaggerated. They do help most people overcome deep inhibitions—making it easier for them to talk about subjects which they would ordinarily regard as taboo. But it must be stressed that they have absolutely no effect on information a person absolutely wishes to withhold.

All of the drugs we have been discussing do have real advantages, of course. But none comes even close to possessing “mind-controlling” powers. And we can all be thankful for that.

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## After the moon, this



NASA'S six-sided manned space station would be partly inflatable, partly rigid. Each of six sides is a cylinder to house an entire crew.

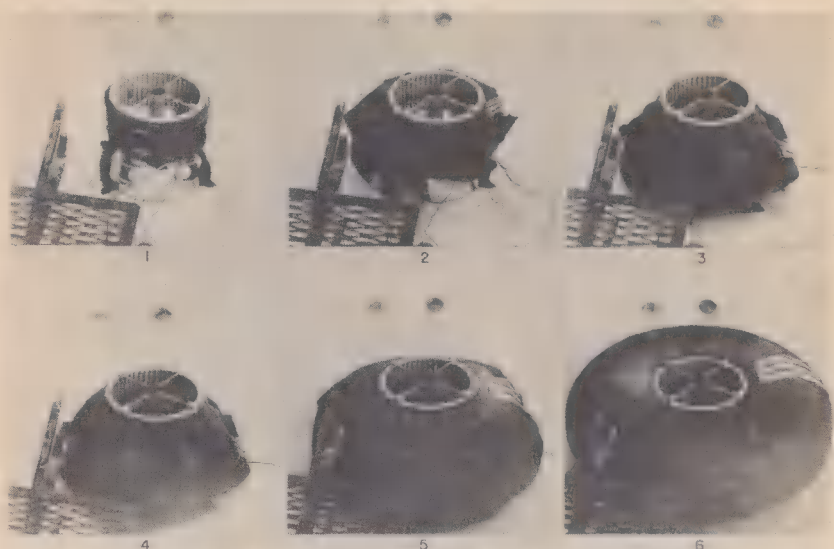
By Frank McGuire

**L**AST April, a 36-year-old research assistant at the University of Maryland climbed out of a 12-by-12-foot steel chamber where he had lived in isolation for five months. "It would be possible to live three

to five years in such confinement," he predicted.

Would he have been so confident if he had been weightless those five months? That is the question asked by space officials who are looking





Langley Research Center is working on various types of stations, including whirling, inflatable labs like the one above, shown during inflation test in vacuum chamber.

ahead to the 1980's and possible manned rocket trips to Mars and Venus.

To answer it, they are planning earth orbiting labs as the United States' next step into space after a moon landing. They want to test man under weightlessness for as long as a year.

Nothing done or to be done in other programs up to 1970 will come close to simulating a Mars flight.

### A taste of weightlessness

Mercury astronauts got only a taste of weightlessness before their flights. In a converted cargo plane at Wright-Patterson Field, they floated for a few seconds at the top of an arching flight path. The long-

est Mercury flight was 34 hours, made by Major L. Gordon Cooper, Jr., last May.

The top time in weightlessness scheduled for the near future is two weeks. This will be when a two-man Gemini capsule is orbited, perhaps by the end of the year. The Apollo man-on-the-moon shots set for the end of the decade will equal, but not surpass that mark.

Thus some kind of space lab seems necessary. The National Aeronautics and Space Administration assigned its big-picture men to roughing out some ideas, and they've started coming in.

Officials at NASA's Langley Research Center favor a small, four-to six-man lab with no provision for artificial gravity. They like it because they claim it could be built

quickly and relatively cheaply at an estimated \$2.5 billion.

The Manned Spacecraft Center at Houston is pushing for a spinning space station. The spin would throw the crew against the outside walls as on a whirling carnival ride, providing an artificial gravity. MSC officials point out that a zero-g lab would tell us if weightlessness is a problem, but not how to solve it.

Their design, which looks like a flying asterisk, would offer both gravity and an opportunity to study weightlessness. The plan calls for three 15-foot-diameter cylinders swinging from a central hub. Each is broken up into six compartments, one above the other.

The whole station, 150 feet across, will pinwheel through space at three to four revolutions per minute. If he doesn't look outside, a crew-member will have no feeling of spinning. It will seem to him that the hub is always overhead and the deck under his feet is as firm and solid as Main Street.

However, if he starts on the first floor at the outer end of a cylinder and goes "upstairs," he will notice himself getting lighter and lighter as he climbs "higher" and "higher." By the time he gets to the hub, he will be weightless. Here in the hub, the weightlessness experiments will be performed.

When he looks outside, however, the crewman will see the earth zoom around the sky, followed by the moon and stars.

At launch, the hub is part of the rocket nose cone and the three cyl-

inders are folded into the body of the upper stage of a Saturn V rocket. When the lab is in orbit, the cylinders snap out like a spring-powered umbrella.

Although Langley is for a zero-g station, it's working on whirling, inflatable labs, too. One, which looks like a giant inner tube, is also being considered as a communications center or weather station. NASA scientists are already throwing artificial meteoroids at a 24-foot-diameter model to test the danger of a blow-out in space.

### Like a smashed bike wheel

Langley's biggest entry looks like a bicycle wheel that was in a smash-up and emerged with six flat sides. Each straight side is a rigid cylinder in which the crew would live and work. Between the cylinders are inflated passageways. The stiff spokes in the wheel hold the cylinders to the hub. The crew could walk from the rim through three more inflated passageways to the hub, where they would carry out weightlessness experiments.

Air Force bigwigs squirmed in their chairs as NASA pondered and planned. They want to flip a station into orbit now with the equipment we already have. This station would be a military lookout post, sort of a space police station complete with patrol cars. It would scan the earth with reconnaissance cameras and watch for missiles and satellites in space. If a satellite looked suspicious, a Gemini patrol

## With one eye on space and one on an earthly rival, NASA and the Air Force elbowed each other for the station job, then agreed to a joint venture.

car would give it a check and perhaps destroy it. At the same time, the patrol cars could run a space-highway rescue and repair service. When otherwise idle, they would ferry crew and supplies back and forth to earth.

So far, the Air Force hasn't convinced Secretary of Defense Robert McNamara that there is a space threat or that it could do anything about it if there was.

Both NASA and the Air Force wanted the space station job. They were keeping one eye on space, one eye on their rival, and their elbows firmly planted in each other's ribs. James E. Webb showed sharper elbows and did most expert jostling.

NASA took a long lead on the Air Force by commissioning a half dozen studies this spring and summer.

### No flavor of aggression

The Administration wants to avoid a strictly military space station, and the charges of aggression it would draw. It has also wanted to prevent a knockdown fight between NASA and the Air Force. The outcome was agreement to a joint venture signed in September.

Some possible ferries now in the works include Gemini, a stripped-down Apollo, the X-20 boost-glide

Dyna-Soar, which has wings, and the M-2, a bug-like craft with a lifting body instead of wings.

Gemini and Apollo will be able to maneuver only slightly as they return to earth. Dyna-Soar and M-2 could steer into any landing spot like an airplane. Two companies are comparing the advantages of shooting a ferry vertically off a launching pad and flying it off the deck, as well as back down.

### Balloon and parachute

In an emergency, one of several methods under study might be used to lower a disabled ferry or space station lifeboat gently to earth. A combination balloon and parachute, called a ballute, already slated for Gemini, could be used on an escape capsule.

The basic idea of another device, called the Paravulcoon, goes back to the last century when hot-air balloon launchings were the high spot of country fairs.

After a parachute has cut a capsule's speed, the Paravulcoon scoops up air which is then heated by a gas burner. Depending on the amount of heating, the capsule will either sink slowly to earth or hover in the sky until it can be snared by an airplane as the Air Force does with Discoverer capsules.

On another backup project, engineers have revived the Buck Rogers backpack, now called a space-scooter.

To help prepare astronauts for these many new gadgets and a space world they have never visited, a space simulator is also being developed, with a TV screen 30 feet across.

NASA officials had hoped these preparations would lead to the launching of a small lab by 1967. It would first be checked out from the ground to see that everything was running smoothly. Then two men would rocket up to it in a Gemini capsule. Later, two more men would be sent up to complete a four-man crew. About every three months or less, part of the crew would be changed. The men would stay different lengths of time. At least one would remain for a year.

This would allow a comparison of how the effects of weightlessness build up in time.

A bigger lab would follow based on experience gained with the first.

This timetable depended on getting money next year for building hardware. When Congress cut the space budget this past summer, NASA postponed its new request for at least a year. This should push back the first space station until 1968, probably later. But come it will.

### Check your LOX?

Looking several decades ahead, an orbiting space station may eventually become a launching platform or a fuel stop where the first travelers bound for Mars and Venus will get a clean windshield and a last, "Bon voyage."

### *Now—"draft" beer in cans and bottles*

**A** NEW filtering technique is said to give packaged beer the same good taste that draft beer offers. In the past, packaged beer has been pasteurized to prevent spoilage, but brewers say that the heat used in the pasteurization process often damages the flavor of the beer.

Key to the process is a paper-thin filter, made from a cellulose derivative, with holes averaging 1.2 microns in diameter. A micron is less than four hundred thousandths of an inch. Yeast cells, which are usually the cause of beer spoilage, are trapped by these holes, which are so small that even cigarette smoke can't pass through them.

The new technique isn't the first to make use of a filter in preventing beer spoilage. One company introduced filtered beer in bottles and cans in 1959. Asbestos filters have been used in Europe. In previously used methods, however, the density of the filters used made it necessary to force the beer through under high pressure, slowing the brewing process and raising costs. The new system, developed through research in bacteriological warfare by Millipore Filter Corp., Bedford, Mass., is said to be far more economical as it is about four times as porous.





Prince



Cabaniss

Co-designers of airborne GEVIC work for G.E. Prince holds computer model.

## Inventors of the month

### Meet GEVIC —the computer that flies

**T**wo General Electric engineers have invented a tiny airborne computer of a new type, called the GEVIC. It is capable of guiding a spacecraft at the proper angle on re-entry and along its course to a selected landing spot.

Computers assigned such jobs are first programed—that is, given general instructions on what is expected of them. Then they know what to do when specific problems are posed. The programing is usually done on the ground. Later, an astronaut or pilot can feed in navigation data and get answers to his questions or have the computer operate the controls.

The GEVIC is described as able to supply highly reliable (triple-checked) flight control for aircraft as well as space vehicles. Used in fire control aboard a fast fighter-bomber, it can release a bomb at the exact point while allowing the plane to pull up from any random path.

John S. Prince and Edward H. Cabaniss, *Science Digest* Inventors of the Month, designed the GEVIC

in the light military electronics department of General Electric Company at Johnson City, N. Y.

After the co-inventors filed their applications for the GEVIC patent (No. 3,109,090), Cabaniss was transferred from Johnson City to serve as a consulting engineer at the company's ordnance department in Pittsfield, Mass.

The working models each occupy only 1.1 cubic feet of space, and weigh 63 pounds. In production, by miniaturization with such devices as pin-head-sized transistors, they can be reduced to three-tenths of a cubic foot and 15 pounds.

Logical customers for GEVIC are the National Aeronautics and Space Administration and the Air Force, but G.E. believes its new instrument can fulfill many civilian assignments. GEVIC is an acronym for General Electric variable incremental computer.

Computer men explain that there are three kinds of digital computers (those that use figures). The most

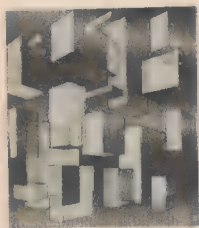
common, or general purpose, computer recalculates with every step it takes. The fixed increment computer calculates only the increment, or change, since the last step.

The variable incremental computer, of which GEVIC is the first, is said to be faster with answers than the fixed increment machine, and just as accurate as the general, or businessman's, kind. In a test, General Electric found that GEVIC solved in one-tenth of a second—about the wink of an eye—a problem that took a con-

ventional fixed increment machine all of 30 seconds. GEVIC, indeed, can perform more than 100,000 calculations per second.

As a spokesman put it, GEVIC has an "automatic transmission." It can adjust its own speed, in 14 steps, over an 8,000-to-1 range. In effect, it can shift into one of its 14 gears and respond to rapidly changing inputs. As a result, there is a smoother data flow plus many more answers than with single-speed transmissions.

—Stacy V. Jones



**INVENTIONS  
PATENTS  
PROCESSES**



## School without windows

**T**HE new McAllen High School, in Texas, has a gas turbine energy package that meets all the school's needs for illumination, heating and cooling.

Designed with the latest study techniques in mind, the school needs all the power it can get because it is windowless. Fresh air is provided by year-round air-conditioning. Lighting is kept at the same intensity, eliminating eye strain from adjusting to differences in room lighting and sunlight intensities.

The natural gas-fueled turbine

which powers the energy system is like an aircraft jet turbine engine. By coupling a generator to the turbine shaft, rotary power is converted to electricity for lighting and other electrical needs. After turning the turbine blades for rotary power, the engine's hot exhaust gases are piped to a steam or hot water boiler. In simple turbine operation, the exhaust heat energy is usually wasted.

Recovered turbine heat is used for heating or to operate an absorption machine which produces chilled water for warm-weather cooling.



A fraction of a second is all the time it takes solar heat focused by reflector to burn a hole through ■ tongue depressor.

### For power: Inflate

One source of power for future astronauts may be a huge headlight-shaped plastic reflector which would focus the sun's rays into a narrow shaft of light.

According to Robert W. Jones, a Hughes Aircraft Company engineer, the reflectors could direct the solar heat at power-converting equipment to produce electrical energy for a long space voyage or a space station.

The parabola-shaped reflectors, up to 100 feet in diameter, would be collapsed and carried into space in "cans" no bigger than a golfbag. In space, they would inflate automatically and would "harden" into rigid structures.

According to Hughes Aircraft, in-

flation of such large plastic membranes has been made feasible by a new process developed by company researchers. The company will fabricate the antenna-like reflectors from aluminum-coated mylar, a tough plastic. The back side of the mylar will be coated with a pliable polyester resin, and a transparent membrane will be attached to the front with a small amount of air between.

In a vacuum, the air trapped between the membrane and the reflector expands and draws the plastic taut. The molasses-like resin is then exposed to ultraviolet rays of the sun, which cause it to harden and form into a rigid structure.

### What happens when you drive?

A real driver, operating under simulated driving conditions, will "take to the road" in an effort to cut the accident toll on our highways. Under a contract from the Public Health Service of the U.S. Department of Health, Education, and Welfare, an auto-driving simulator that can be used right in the laboratory is being developed by Goodyear Aerospace Corp. According to the company, the simulator test model will be one of the most realistic devices ever built for laboratory research.

Test subjects in a car will see simulated road conditions on a large screen mounted in front of the car. The image will be projected by closed-circuit television. A terrain model will be used as the test area.

The movement of the test auto will be simulated on the model landscape by a mobile television camera that will move along the road in relation to the direction "driven" by the test subject.

The illusion of driving in dusk—or in the bright daylight—will be given by the specially reflective screen on which the images are projected.

The auto will simulate normal driving maneuvers such as shifting, steering, traveling at speeds up to 70 mph, and stalling. The driver's actions will be monitored from an operator's console next to the auto.

### Wash-N-Dry laundry protection

The Wash-N-Dry Nylon Mesh laundry bag affords a way of keeping delicate items lint free and giving them extra protection. It was designed especially for use in self-service, coin-operated laundries and dry-cleaning shops. The clothes are merely put into the bag and then cleaned or laundered. The bags are 15 by 21 inches, and have a rust-proof zipper. They can be ordered from Textile Bag and Specialties Co., Dept. 200, 3340 Frankford Ave., Philadelphia, Penna.

### Arm-rest travel case

The Car-Y-All travel case becomes an arm rest for the driver of a car while it also serves as a travel case for holding such objects as cigarettes, glasses, cosmetics, maps, pencils and tissues. It contains a

concealed, removable coin-holder for parking meters, tolls, etc. Car-Y-All is manufactured by Ark Enterprises, Dept. 112, 42½ Miller St., Bradford, Penna.

The case features luggage-type construction and is covered in antique-finished Ostrich fabric that is washable and scuff-proof. It is available in blue, black, tan, red, and grey.



### Cold? Try this

Sun Gun is a heating unit which generates infra-red heat, projected by a reflector, as a flashlight throws a beam of light. It utilizes a small

Sun Gun, versatile heat source, can do a lot of things, including broiling ■ steak.





cigar-shaped core called a Pyrocore.

The versatile unit heats and cooks, and, as it has no flame, it can be used out-of-doors in the wind. It requires only about one-fourth the amount of air used by small open-flame gas burners.

It will, according to its maker, broil a steak in 5 to 7 minutes, heat frozen foods, defrost freezers, dry hair, clothes or paint, and even function as an infra-red heat source for the relief of muscular aches and pains. It will also kill worms and larvae without damaging plant life.

Made of heavy duty aluminum, Sun Gun will operate up to eight hours on any Standard I.C.C. and U.L. approved propane gas cylinder. It has an input of 2,500 B.T.U. per hour and costs about ten cents an hour to operate. The replaceable core is good for about 500 hours. Available from Polyplastic Forms, Inc., Gazza Blvd., Farmingdale, N.Y.

### **Martini with magnet**

Magno-Mix, according to Consolidated Industrials, Inc., is the first drink mixer based upon a magnetic principle. It is made of solid brass mounted on hexagonal wooden base and comes with four magnets for mixing.

To mix a drink, you drop a plastic coated magnet into the drink and turn the dial, setting the magnet into rotation. The rotating magnet creates a whirlpool effect, and can mix a variety of drinks.

Further information can be ob-

tained from Consolidated Industrials, Inc., P.O. Box 5208, Richmond, Va.

### **Sea shell hosiery dryer**

A colorful hosiery and lingerie dryer that folds up into the shape of a sea shell is designed to help control clutter in the bathroom. The Sea Shell Hosiery Dryer can hold up to 32 stockings, socks or gloves within 8 inches of wall space. It comes in periwinkle blue, Nile green, petal pink, canary yellow, ebony black and crystal clear. It is available from Sea Shell Plastic Sales, Box, 4885, Ft. Lauderdale, Fla.

The unit can be installed in a few minutes with a self-adhesive mounting which may be affixed to tile, porcelain, wood or enameled surfaces.

A compact lingerie dryer answers the question of where to hang 32 wet stockings.



# Could we be Nazi followers?



**D**OES it take a madman or a monster to help send millions of men to their death on order, as in Nazi Germany? Or do the seeds of such slavish inhumanity exist in all of us?



Yale University tests show that a chillingly large proportion of people will blindly follow orders even if they can see that they are inflicting severe pain on another human being.

Such people don't enjoy being cruel. In fact, some of the subjects in the experiments became distraught. A report of the experiment described the reactions of one subject, "a mature and initially poised businessman." He entered the laboratory "smiling and confident," the report said. "Within 20 minutes he was reduced to a twitching, stuttering wreck, who was rapidly approaching a point of nervous collapse."

At one point, it said, "he pushed his fist into his forehead and muttered: 'Oh God, let's stop it.' And yet he continued to respond to every word the experimenter said, and obeyed to the end."

What was the subject doing that could provide such a reaction? This businessman and 39 other subjects of various callings and ages were recruited to take part in an experiment that they were told would test the effect of punishment on learning.

They were seated at a console lined with 30 switches. According to labels on the switches, each of them, in succession, administered a more severe shock to what appeared to be a volunteer learner sitting in an "electric chair" in an adjoining room.

The first bank of switches was marked "Slight Shock" and succeeding banks were labeled for shocks of increasing severity to "Danger: Severe Shock," and finally two switches bearing the ominous mark: "X X X."

Subjects were told that they were the "teacher" and that when the "learner" in the next room made a mistake, the "teacher" should flip a

switch, increasing the shocks each time.

The "learner" was an accomplice of the experimenters and didn't get any shocks at all. But the "teachers" didn't know this, and when the 300-volt switch was flipped, in the "intense shock" category, the learner would begin to cry out as though in pain. He'd also bang on the wall and demand that the "teacher" stop. But the experimenter would tell the "teacher" to continue.

At this point there remained 10 switches, each of which would "inflict" more "pain." Only 14 of the 40 subjects defied the experimenters' orders and refused to go on with the experiment.

Dr. Stanley Milgram, who conducted the experiments, found the high rate of blind obedience surprising. He said that some of those who watched through one-way mirrors expressed disbelief as one man after another kept increasing the shocks.

Dr. Milgram pointed out that in Germany, from 1933 to 1945, "millions of innocent persons were systematically slaughtered on command. Gas chambers were built, death camps were guarded, daily quotas of corpses were produced with the same efficiency as the manufacture of appliances."

He noted that obedience is an essential element of any society, but that the purpose of this study was to seek out the roots of blind obedience.

Among the 40 subjects, some displayed such nervous symptoms as

unnatural smiles and "bizarre" laughter, particularly as they thought they were administering the more severe shocks. In one preliminary experiment, a "teacher" became so violently convulsive that the experiment had to be stopped.

In looking for the reasons behind this surprisingly high rate of blind obedience, Dr. Milgram points out that the image of Yale as a seat of learning would convince subjects that they were not engaging in capricious experiments.

The subjects were also told that the shocks would do no permanent harm. An effort was made to impress them with the importance of the experiments and they were led to believe that the "victim" had undertaken his role voluntarily.

Before tests, however, a group of psychology students estimated the number of people they thought would continue to follow orders to the end. The most "pessimistic" expected only 3 percent to flip all 30 switches. The actual score was 65 percent.

In similar experiments among different groups of people or in different settings, the results have been just about the same as those obtained in the main experiments; over 50 percent of the subjects followed the orders out to the end.

## **A psychological puzzler**

White boxes look bigger to whites than they do to Negroes and Dr. Thomas F. Pettigrew, a Harvard social psychologist wonders why.

He showed drawings of boxes to 50 Negro and 50 white boys, who ranged in age from 10 to 14. A black box was drawn on a white card and a white box on a black card. Both boxes were the same size—five-eighths of an inch square. The cards were held 10 feet away from each boy.

White boys nearly always said the white box was bigger, Dr. Pettigrew reported. Negro boys, to a significant extent, correctly said the boxes were the same size.



The illusion is so "compelling," Dr. Pettigrew said, the black box has to be made 10 percent bigger before white people will see it as equal. Tests on adult Negroes also revealed some interesting parallels. The researchers found that pro-integrationists were more susceptible to the illusion than those not involved in integration.

African Negroes, according to an earlier French study, "fight the illusion" better than whites and, Dr. Pettigrew pointed out, even better than American Negroes.

Dr. Pettigrew believes the illusion is a case of simple symbolism. "You tend to see more powerful things as bigger," he explained, "and you tend to think of bigger things as more powerful."

Of course there is another way to

explain it, he admitted. Negroes may just have better "visual acuity;" that is they can tell outlines of distant objects somewhat better than whites can.

African Negroes, more "racially pure," could see the illusion better than American Negroes, whose genes are mixed.

### ***Secrets of schizophrenia***

What causes schizophrenia, the most common and one of the most severe forms of mental illness? Does it come from childhood disturbances, or from an actual physical defect that affects the brain?

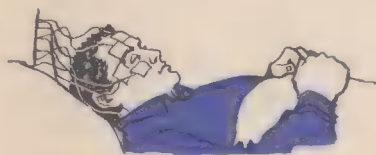
A new way of measuring the brain activity of the schizophrenic lends support to the theory that an abnormal body chemistry may be in part responsible. Using an electroencephalograph (EEG), a highly sensitive instrument that measures brain activity, Dr. Leonide Goldstein and his associates have found that the brain activity of a schizophrenic differs markedly from that of a normal person.

Dr. Goldstein, with the aid of a computer, compared the EEG readings of 16 schizophrenic patients with EEG readings taken from normal persons. He found that normal persons have twice the variability in brain waves as does the schizophrenic. Schizophrenics therefore had an unusually low level of fluctuation in energy output. "This suggests," Dr. Goldstein said, "that the schizophrenic's brain is under rather constant stimulation."



Brain waves similar or identical to those of the schizophrenic can be produced in normal persons when they are under the influence of the hallucination producing drug LSD-25 (see page 67). People who suffer hallucinations from overuse of amphetamine pep pills will also show similar brain wave patterns.

If drugs can produce schizophrenic-like reactions perhaps they can cure them. And so they can—up to a point. Dr. Goldstein found that schizophrenic brain wave patterns improve and approximate normal patterns when the patient uses such tranquilizers as thorazine and terthenidine. But the improvement continues for only a few months.



The findings, however, have produced the first truly objective way of identifying schizophrenia, and ultimately may help in testing new drugs and treatments.

### **An experiment gone wrong**

Dr. Robert Gossette, a psychologist at Hofstra University, was trying to find out if there was any similarity between the way a myna bird (a tropical crow, with a gift for gab) learns to speak and the way human babies learn, by mimicking adults.

Months ago, he began teaching a myna words, and the experiment was going splendidly. Then it seemed the bird grew up too fast, and began swearing like a trooper. What was worse, he began swearing at university officials.



Shocked, they ordered the bird off campus. Dr. Gossette investigated and found that some men who work at the university at night were conducting an experiment of their own—they wanted to see how fast a bird could learn to swear.

Now Dr. Gossette is conducting an experiment to see if a bird can unlearn profanity.

### **Radiation and brain damage**

Findings at the University of Michigan Medical Center show that "remarkably low" levels of radiation can injure the developing brain.

The evidence was collected by Dr. Samuel P. Hicks and Constance J. D'Amato of the pathology department. They irradiated different litters of rats on the 16th, 18th and 22nd day of the mother's pregnancy, and on the day after birth.

Dr. Hicks says the findings show that radiation of a much lower intensity than expected can have a marked effect on the developing brain.


# Tetanus: the disease we can prevent but don't

by Joseph D. Wassersug, M.D.

Tetanus, or lockjaw, is an agonizing disease that kills more than 400 Americans every year. Yet it is almost completely preventable. A doctor describes this killer and how to avoid it.

A YOUNG man was admitted not long ago to the Cook County Hospital in Chicago. As he lay on a stretcher in the accident room, the slightest sound, the briefest noise, threw him into a violent convulsion, arching his back, tightening the muscles of his face, and setting his jaw so that he couldn't open his mouth more than a quarter of an inch. The young man had tetanus, commonly known as lockjaw.

To control his agonizing fits, the doctors gave him an injection of a powerful sedative and rushed him to a quiet, private room so that they could give him more intensive treatment.



Simple wounds can cause agonizing and unnecessary deaths. They're often not properly treated because tetanus symptoms may not appear for three weeks.

A.M.A.

**You don't have to step on rusty nails to get lockjaw.  
Any deep or crushing wound can give it to you.  
And it kills more than half those who contract it.**

Had he stepped on a rusty nail? No, you don't have to step on rusty nails to get lockjaw. Any deep or crushing wound can give it to you. In this case, this patient had crushed his left thumb in an automobile door nine days before the onset of his first symptoms. The crushed finger had hurt terribly at first but, later, the pain subsided and it was ignored. It was not until nine days after this accident, which had almost been forgotten, he complained of a mild headache and some stiffness of his neck. He felt a little feverish and sick. Still, that was nothing to worry about.

Then, the day he was rushed to the accident room of the hospital, the convulsions began in earnest and his temperature rose to 101°. Since death from lockjaw is usually due to respiratory paralysis and suffocation, it was necessary to make a tiny incision into his windpipe and insert a small metal tube to help him breathe. Large doses of penicillin had to be injected into his muscles. Anti-tetanus serum had to be given intravenously.

While in the operating room, the wound on his thumb was cleaned out and opened up to allow air in to get rid of the tetanus germs that grow best where there is no air. A few days later, it was possible to pass a rubber tube through his nose

and into his stomach so that liquid feedings could be started. His bladder was emptied with a catheter which was left in place because even the mere act of urination could precipitate another convulsion. Ultimately, after five weeks in the hospital, the boy went home, having recovered from almost certain death.

Tetanus is a disease that kills more than half the people who contract it. In this sense, it is still one of the most fatal diseases known to man. It is also a disease that is almost 100 percent preventable. Had the young man been properly immunized—a simple thing to have done—he would never have gotten tetanus in the first place!

The germ that causes tetanus is a tough bacillus that grows by spores that are even tougher. The germs grow and multiply where there is no air, deep in tissues that have been destroyed or infected. As they grow and multiply, the tetanus bacilli manufacture tetanus toxin, one of the most poisonous chemicals in the world. It is this poison circulating through the blood that causes convulsions and death by damaging the nerves and the respiratory system. The disease is treacherous in that the definite symptoms may not appear for four days to three weeks after infection or initial injury. Because of this latent peri-

od, wounded or injured persons may not seek help until it is too late.

Many people believe that tetanus is acquired by stepping on a rusty nail. Unfortunately, this is all that most people seem to know about it. Actually, in these days of numerous automobile collisions, burns, and other accidents, deep wounds occur in which tetanus toxin can be produced.

Frequently, the first symptom of tetanus is stiffness of the jaw but, in other cases, restlessness, irritability, stiffness of the neck and difficulty in swallowing may herald the onset of the disease. Within a day or so, the back muscles and the muscles of the neck also become stiff and the stiffness of the jaw muscles becomes worse, increasing as the patient attempts to eat or drink. Convulsions then set in, painful convulsions that are precipitated by the slightest stimulation, such as the ringing of a bell or the touching of bedclothes. If treatment fails or if the disease is untreated, death comes with the spasm of the muscles of the throat and respiration.

### **Needless agonies and deaths**

All of this is preventable and, unlike polio or measles, the prevention of which has only recently been made possible, the method of preventing tetanus was discovered almost fifty years ago and its effectiveness tested through three wars.

In tetanus, the poison that kills is tetanus toxin, a secretion of the germ or bacillus. This toxin can be

treated by chemicals in such a way as to transform it into a harmless toxoid. If this toxoid is injected into persons, it nevertheless stimulates their body to produce an immunity better than that which can be achieved by actually having had the disease. Tetanus toxoid does not contain any harmful germs or microbes. It is a chemical, not a vaccine made out of dead or weakened germs, and, in this respect, it is safer than polio, influenza or even smallpox vaccinations.

Toxoid must not be confused with antitoxin which doctors use to treat non-immune persons who have just stepped on a nail or have had a similar hazardous accident. Antitoxin is not simply a neutralized toxin; its injection provides only temporary immunity. To get tetanus antitoxin, biologists first have to inject tetanus toxin or toxoid into a suitable animal (usually a horse) and then wait until the animal builds up its own immunity in its blood stream. A portion of the animal's blood is then drawn off and the serum is purified and further treated so as to contain a high degree of antitoxin activity. Antitoxin is "made" from the blood of injected animals. Since antitoxin contains blood products of the animals from which it is derived, it may cause serious allergic reactions when injected. Before giving patients antitoxin, doctors invariably perform a skin test (or some other test) to determine whether the patient is allergic to the antitoxin. If there is no allergy, antitoxin is injected to tide the pa-



**In World War II, the Army started giving men toxoid before they were wounded. Today, it's virtually free of tetanus. But the civilian toll continues.**

tient over the next few critical days. This is called passive immunity. Once the protective effect of the antitoxin wears off, the patient is again susceptible to tetanus should he have another accident. With toxoid, on the other hand, "booster" shots can be given to create life-long immunity. This is called active immunity.

Tetanus kills far fewer people than heart disease or cancer, but it numbers its victims each year in the hundreds. At the Cook County Hospital over the past twenty-five years, there have been more than 300 cases. Southern states are more heavily hit by tetanus than northern areas. Deaths from tetanus in southern states account for 53 percent of the nation's total, although the south has only 24 percent of the United States' population. Records at the New Orleans Louisiana Charity Hospital for 1957 and 1958 show there were three times as many cases of polio as tetanus but there were seven times as many deaths from tetanus. Figures recently released by United States Public Health Service show that the 1961 rate of tetanus has had no decline in the average of 450 cases a year.

The existence of tetanus as a disease has been recognized for centuries. The tetanus bacillus that causes the disease was discovered

long before the turn of the century, but it was not until World War I that any concerted effort was made to reduce the toll of this killer. The U. S. Army made it a rule for every soldier to have an injection of tetanus antitoxin as an immediate emergency measure if he were wounded. Consequently, in the American troops in France, the incidence of tetanus dropped to 0.16 per 1000 wounded men.

But to give our soldiers antitoxin was not enough. Why not give them toxoid before they got wounded? With the start of World War II in 1941, it was left to Dr. Perrin H. Long, Chairman of the Committee on Chemotherapy of the National Research Council, to convince the Army that such immunization was essential.

So, in World War II, thanks to an intensive program of administration of tetanus toxoid instigated by Dr. Long, the incidence of tetanus fell to 0.44 per 100,000 injuries. Only 12 cases of tetanus were recorded in an Army of 2½ million men. Of these 12 cases, only 6 had had any toxoid injections and only 4 of these had had basic immunization plus an emergency booster dose.

Today, the Army is virtually free of tetanus cases but the toll in civilian life continues. Nevertheless,

there are increasing signs of an awakened consciousness that tetanus can and should be wiped out.

For example, in Los Angeles, a crash program to take both polio and tetanus immunizations directly to the people has been launched by the Los Angeles County Medical Association in collaboration with the city and county health department. Dr. Joseph P. O'Connor, Association President, said recently, "The group has mobilized its 8000 members to combat public apathy and to send physicians to the public instead of waiting for the public to come to them." In Los Angeles now, any organized body—church, factory, trade union, club—may request its own immunization clinic by simply telephoning the Association. In addition, the Association's headquarters have been kept open between 5:30 p.m. and 9:30 p.m. on weekdays for the benefit of those who want to stop by. The charge is one dollar per injection for all but the needy and those who take advantage of the program get the first of the series of polio shots and also tetanus toxoid.

### Unprotected lives

A recent study by Dr. Wesley Furste and his associates in Columbus, Ohio, shows that most individuals coming to the emergency room of the Riverside Methodist Hospital have not been adequately immunized prior to the injury that brought them in. Dr. Furste and his associates also believe that im-

munization with tetanus toxoid should be made nationwide.

Although there are many possible schedules of immunization against tetanus, one recently recommended by Dr. Geoffrey Edsall, of the Commission on Immunization, Armed Forces Epidemiological Board, appears to be suitable in most cases. It is as follows:

*Infants between 2 months and 5 years old:* Three injections of DPT (tetanus-pertussis-diphtheria toxoid) or 4 injections of combined DPT-Polio Vaccine (quadruple antigen) spaced at least one month apart. These should be followed by a reinforcing dose one year later and a booster when the child is 4 or 5 years of age.

*Children 5 to 10 years old:* Two injections of precipitated (or 3 injections of fluid) tetanus-diphtheria toxoid spaced at least one month apart, followed by a reinforcing dose of the same preparation one year later and a booster four years later.

*Children 10 years or older and adults:* Same schedule as for children 4 to 10, but using the adult type of tetanus-diphtheria toxoid.

In other words, a simple, safe injection program is all that is necessary to protect you and your family from ever getting lockjaw. Practically every doctor and every clinic is equipped with enough toxoid to do the job completely. No shortage of tetanus toxoid exists. There is only a shortage of time. Delay in being adequately immunized may be the fatal mistake.

## The lizard that runs on water



THE basilisk is a mythical beast that could kill a man simply by breathing on him. The basilisk is also a real South American lizard than can run along on its hind feet. When really in a hurry, it can zoom over the surface of the water for as much as a quarter of a mile.

This is just one of the fascinating animal facts to be found in Osmond P. Breland's book *Animal Life and Lore* (Harper and Row, New York City, 388 pp., \$6.95). Zoologist Breland has collected oddities about everything from the largest whale to the smallest protozoa.

Breland destroys some cherished animal legends. For example:

*The ostrich does not hide its head in the sand.* They are stupid birds—but not that stupid. The legend probably got its start because of the ostrich's habit of dropping to the ground and stretching out its neck parallel to it when it sights possible danger. But, when danger is close "the ostrich reacts as other animals do and beats a hasty retreat."

*Moles are not blind.* True, they don't see much, but they do have eyes and even the most poorly sighted can tell light from dark.

*Bears don't hibernate.* Some do a lot of sleeping during the winter, especially in colder areas, but their

body temperature and breathing remain relatively normal, unlike true hibernating animals whose life processes slow down drastically. And a bear will often get up for a day or so during the winter. Among the bears that face the worst winters, the polar bears, only the pregnant females go into a prolonged sleep.

But if these legends disappear, Breland has an equal number of odd facts to take their place.

Did you know that llamas defend themselves by spitting? If you annoy one at the zoo, you may receive a shower of saliva, which the llama can spit through its teeth with devastating accuracy, for some distance.

Raccoons do wash their food. Some of them enjoy the washing so much that they will practically wear a piece of food out with enthusiasm.

While chameleons can change color, they are not as good at it as is popularly believed. But flatfishes, flounders and turbot are the champion color changers. They really can match a checkerboard background.

*Animal Life and Lore* will give you enough bits of information to fill in those uncomfortable gaps in conservation—enough probably to fill an entire uncomfortable evening. —D.C.

# Science in the news

For ten days, the world had a dream: Russia had pulled out of the moon race. Khrushchev did say, "We do not want to compete with the sending of people to the moon without careful preparation." But his last three words were overlooked by almost all, along with seven other words: "Soviet scientists are working on this problem." Because so many misread him, he told U.S. visitors ten days after his first statement: "We have never said we are giving up our lunar project. You're the ones who said that."

Meanwhile, the U.S. space-fever chart, once red hot, then icy cold, inched back toward normal levels. Russia said it had launched a new kind of satellite, Flight 1, which the Soviets said was so maneuverable, it traced "complex figures" in space. We, in turn, got set to launch the huge Saturn 1 vehicle with a payload of 19,000 pounds, 4,000 more than anything the Russians had ever sent up.

Will we make it to the moon by 1970? Well, NASA acted to streamline the manned space flight program. And George Mueller, the program's new director, hoped for a "miracle."



## Science in the news

Getting out of this world, incidentally, is getting to be the biggest thing IN the world --at least in the industrial world. A report in Missiles and Rockets said the missile-space industry has surpassed steel and is about to overtake the automotive industry as the top industrial employer in the U.S. From 1958 to '62, the number of employed jumped from 319,000 to 711,000. The latest available auto figure (for 1962) is 723,000.

Fourteen new astronauts joined the moon program. They're younger than earlier space pilots (average age, 31) and have had more schooling (average, 5.6 years of college). Two are civilians.

SPACE SHORTS: The U.S. and Russia agreed to allocate wave bands for radio and television communications between earth and space.... The first Project Gemini spacecraft was delivered at Cape Canaveral, but the first flight may have to be limited to a few days because of difficulties in the power system. ...The bedeviled Ranger series of unmanned shots to the moon ran into a new snag after deficiencies were found in transistor diodes --the New York Herald Tribune said they were 35¢ diodes made for home-made hi-fi sets. ...The world's biggest radio telescope was dedicated in Puerto Rico. It consists of 18 acres of chicken wire laid on the ground in the form of a dish, with a so-called "feed" suspended above. It can pick up radio waves from space hitherto undetected or send radar impulses far below the moon's surface.

Defense Secretary McNamara said we have a strategic nuclear deterrent far exceeding Russia's--but military scientists were worried. The New York Times reported a Defense Department drive to develop weapons able to destroy bomb-carrying satellites. Ground-to-space weapons, it said, may already have been tested in the Pacific. And Science News Letter reported a new fear--that one A-bomb could set up an electromagnetic pulse that would immobilize U.S. retaliatory missiles hundreds of miles away by inactivating their control systems.

The national reactor testing station near Idaho Falls, Idaho, went into operation, promising a new era in nuclear power. The nuclear fuel produces heat to generate electricity and simultaneously produces new fuel by a transmutation process within the reactor. The AEC said the process "is of great significance" as to fuel resources, costs.

Science faces a long battle to offset a rebellion against research and development. Rep. Melvin Price (Dem., Ill.), a Congressional authority on R & D, said Government programs must be managed better before "corrective action" is undertaken by those who are "less considerate." Meanwhile, Science Magazine said in behalf of scientists: "Congressional diagnosticians rarely look at the whole patient." It urged "educating the Congress in how science thrives."

## Science in the news

How can a seismograph tell the difference between an earthquake and an underground nuclear blast? Scientists of Columbia University's Lamont Geological Observatory will lower seismographs to the floor of the Pacific next summer. They will be attached to a land station by over 100 miles of cable. The system should avoid the local tremors picked up by seismographs situated on land and provide distinctly discernible differences.

The Weather Bureau reported progress in its efforts to take the punch out of hurricanes. It said chemical "seeding" of Hurricane Beulah in August reduced wind velocity more than 30 per cent, widened the hurricane's "eye" significantly and produced a much more uniform distribution of pressure in the center. How? Well, seeding changes water droplets in clouds to ice crystals, releasing heat, which cuts down the wind.

HERE AND THERE: Dr. Tracy M. Sonneborn, U. of Indiana geneticist, reported a substance called "crazy RNA." An organism named paramecium seemingly makes the substance to take messages from the genes to protein-making centers. But the RNA, instead, goes "crazy," duplicating itself in the paramecium, even in other organisms....Dr. Gerald S. Hawkins of the Smithsonian Astrophysical Laboratory used a computer to unravel the mystery of Stonehenge. The 4,000-year-old English monument, he figured out from the pattern of the stones, was used as a calendar for crops.

UC's Dr. Maria Goeppert Mayer became the first American woman Nobel prize winner. She shared the award in physics with Germany's Dr. J.Hans D. Jensen and Princeton's Dr. Eugene P. Wigner. Prof. Giulio Natta of Italy and Prof. Karl Ziegler of Germany shared the prize in chemistry. The King of Sweden was to make the presentation in December.

TO YOUR HEALTH: The AMA published a report indicating positive results with a two-in-one vaccine against measles and polio.... A report to the American Public Health Association presented what was termed the first clear evidence that the polluted air of a city raises the death rate.... Government scientists said they doubted the effectiveness of flu vaccines and their general use was not justified....The head of the hormone branch of the U.S. National Cancer Institute warned women to take hormones with care, if at all, for fear of cancer....British investigators found that strong cheeses and some tranquilizers could kill a patient who took both. The mixture raises the blood pressure.

QUOTE OF THE MONTH: "In my opinion, the space program we have is essential to the security of the United States, because as I have said many times before, it is not a question of going to the moon; it is a question of having the competence to master this environment. I would not make any bets at all upon Soviet intentions."--PRESIDENT KENNEDY.







Australian News and Information Bureau

## OUT-OF-POCKET KANGAROO

**T**HIS is what a baby kangaroo looks like after he has been in his mother's pouch for 130 days. Australian scientists have temporarily taken him out of the pocket to weigh and measure him.

When born, an immature kangaroo (or joey, as the Australians call him) is less than an inch long, earless and has mere buds for hind legs. These grow quickly, however, and an adult kangaroo has huge, powerful legs. The front legs are fairly well developed at birth and he uses them to climb into his mother's pouch.

A kangaroo is born with his eyes closed and his mouth open. When he reaches his mother's pouch, he grabs hold of a nipple and hangs on. It is months before he has grown enough to leave the pouch.

The reason for this rather unusual childhood is that the kangaroo is a

marsupial, a primitive type of mammal. In most higher mammals, much of the development of the young takes place before birth. Not so with the marsupials. The time between conception and birth of a kangaroo is less than three weeks, an extremely short period.

Despite its low status on the evolutionary scale, the kangaroo has been remarkably successful in adjusting to man, too successful perhaps for its own good, for now many, but by no means all, Australian farmers consider it a pest.

The lack of agreement is due to a surprising shortage of information on the habits of kangaroos.

To find out more about them, the Australian government has been raising kangaroos and studying their living habits, even before, as in the picture above, they are ready to go out into the world.



## In this issue . . .



How would you feel if you were a midget? Would you be doomed to a "freak show" existence? Not any more. The "little people" are moving out into the everyday world. Page 30.



Babies can't talk. How then can we find out what is going on in their unpredictable little minds? The famous Yale psychologist Dr. Arnold Gesell has devised a way to test a baby's I.Q. For a delightful series of photos on how these tests are given and what they show, see page 8.



For some breezy questions about the air around us, see the quiz that starts on page 45.



Life for 1964's baby will be quite different from life today. Based on what science has done and will do, Science Digest predicts the pattern of his schooling, his work, his health. Page 12.



Linemen, who have always avoided touching high tension wires, can now grab them with their bare hands. Find out how on page 35.

Tetanus, or lockjaw, kills more than 400 Americans a year. Yet it can be prevented. A doctor tells you what you should know about tetanus. Page 85.

One day in the not too distant future, a manned space station will be orbited. It will be more important than a man on the moon. Page 71.



Throughout history, hiccups have been one of nature's most persistent and most annoying disorders. Cures have ranged from standing on your head to putting a bag over your head. There is no sure cure for hiccups, but for a guide to the most effective treatment, see page 27.

